

CRATAEGUS SERIES PARVIFOLIAE AND ITS PUTATIVE HYBRIDS IN THE SOUTHEASTERN UNITED STATES

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ABSTRACT

This paper deals with *Crataegus* series *Parvifoliae* (Rosaceae, subfamily Pyroideae) in the main part of its range, the southeastern United States. Two species, *C. uniflora* and *C. brittonii*, are recognized together with one putative interserial hybrid, *C. ×vailiae*. A number of other obscure entities are also discussed. The series and constituent species are provided with detailed descriptions, full synonymy, keys to taxa and are typified so far as possible. Line illustrations and county level distribution maps, the latter derived from a database of over 1200 records, are also given for each species treated.

KEYWORDS: *Crataegus*, series *Parvifoliae*, Rosaceae, taxonomic revision, interserial hybrids, southeastern United States

RESUMEN

Este artículo trata de *Crataegus* serie *Parvifoliae* (Rosaceae, subfamilia Pyroideae) en la parte principal de su área, el sureste de los Estados Unidos. Se reconocen dos especies, *C. uniflora* y *C. brittonii*, junto con un híbrido putativo interserial, *C. _vailiae*. Se discuten también un número de entidades poco claras. Tanto de la serie como de las especies constituyentes se ofrecen descripciones detalladas, sinonimia completa, claves de los taxa, y se tipifican en lo posible. Para cada especie tratada se dan ilustraciones y mapas de distribución a nivel de condado derivados de una base de datos de más de 1200 registros.

INTRODUCTION

The first author was asked to prepare the *Crataegus* treatment for the *Vascular Flora of the Southeastern United States* only vol. 1 (Cronquist 1980) of which, however, was completed. In spite of the soon defunct status of this flora JBP continued with this *Crataegus* project which is now being issued as a set of accounts usually dealing with individual or a few series, e.g. Phipps (1988, 1998). The third of these is presented here and deals with *Crataegus* series *Parvifoliae*. This series extends well beyond the borders of the flora area, to Texas and Mexico westwards and New York and New Jersey northeastwards; however, it is best represented in the southeastern United States. Here, there is one widespread and abundant species, *C. uniflora*, which is somewhat variable, plus the local *C. brittonii* (perhaps the same as *C. rhodella* of western North Carolina). Several of the names that have been synonymised with *C. uniflora* nevertheless repre-

sent distinct nodes of variation and these will receive explicit comment here. Forms such as *C. ×vailiae* and related types, however, appear to represent interserial hybrids with *C. calpodendron* (series *Macracanthae*) but are treated here for convenience.

The primary function of this paper is to provide a taxonomic revision that illustrates the variation within series *Parvifoliae* and its putative interserial hybrids in a synoptic manner. *Crataegus uniflora* has often been illustrated but its more variant forms have not, as with *C. brittonii*, and both are illustrated here as well as the putative interserial hybrid *C. ×vailiae*. None of the taxa recognized in this paper, even *C. uniflora*, have ever received detailed range maps so far as can be determined. While the raw information to create dot maps did exist in our database, the scale of work necessary to provide each specimen with its mapping coordinates precluded such an ideal approach and instead, county maps, refined so as to indicate record frequency, were made. An appendix lists one representative specimen per county. A key to all taxa recognized here is also provided. The taxa recognized and their synonyms are typified so far as possible. However, lack of lectotypifiable material for the Ashe names involved has caused familiar difficulties for the typification of his names. In the cases encountered here, resolution through neotypification was not, however, adopted because of the arbitrary aspect of making type choices that would correctly match critically defective protologues. The situation with *C. rhodella* (discussed on p. 433) perfectly exemplifies this. Fortunately, although Ashe names constitute the majority in series *Parvifoliae*, the variation encountered in the exsiccatae and field material seen could all be accommodated within the names of other authors. The synonymy provided is based on names encountered in Palmer (1925). The paper will commence with a description of the series, follow with descriptions of the constituent taxa and close on the putative interserial hybrids.

This work has been made possible by loans of over 1200 specimens from 43 herbaria and the first author has endeavored to see and collect representative exemplars in the field of all the taxa treated in the course of over 20 field trips to the southeastern United States. However, the rarer forms, which apparently have always been rare, were never encountered in fieldwork, and possibly no longer exist. The database of specimens is held at UWO. The taxonomic decisions have been made by the first author (J.B.P.) and the second author (K.D.) has been responsible for creating the distribution maps.

The ultimate resolution of variation in series *Parvifoliae* and its putative interserial hybrids invites a further generation of work in which extensive population studies are supported by chromosome counts, critical morphometric analysis as well as molecular studies. The revisionary treatment presented here thus erects the platform for such work.

TAXONOMIC TREATMENT

series **Parvifoliae** (Loudon) Rehder, Man. Cult. Trees Shrubs, 2nd ed. 1940. Sect. *Parvifoliae* Loudon, Arbor. et Frutic. Brit. 2. 1838. Group without rank *Uniflorae* Beadle, *nom. nud.* Biltmore Bot. Stud. 1:117. 1902. TYPE SPECIES: *C. uniflora* Muenchh.

Small, \pm xeromorphic shrubs with fine straight thorns. Leaves deciduous; usually nearly epetiolate, petioles glandular or eglandular; blades small, longer than broad, entire, and often with conspicuous black glands on the tips of the teeth; unlobed to shallowly lobed; margins crenate or crenate-serrate; \pm pubescent, coriaceous. Inflorescences 1-few flowered, bracteolate, the bracteoles small, caducous, linear, gland-margined, membranous to thinly herbaceous. Flowers 10-18 mm diam.; hypanthium externally dense-tomentose; calyx-lobes foliaceous, us. glandular-serrate, often deeply so, as long as to somewhat longer than the petals; petals \pm circular, white; stamens 20, anthers us. ivory to cream; styles us. 5. Fruit up to 12 mm diam., \pm orbicular, us. quite hairy, yellowish to ruddy; calyx-lobes conspicuous, patent, glandular-serrate, often deeply so; nutlets 4-5, dorsally grooved, sides plane.

This is a small series confined to North America. It consists mostly of one somewhat variable species, *C. uniflora*, widespread and often common in the coastal plain from Texas to Long Island (N.Y.) with outliers further inland and in Tamaulipas, Mexico. There is also a second, much rarer species, *C. brittonii*, from North Carolina and adjacent states. In addition there are three dubiously placed entities, *C. croomiana*, *C. grossiserrata* and *C. choriophylla* that will receive brief discussion. Of the 15 names assigned by Palmer (1925) to series *Parvifoliae* (as natural group *Uniflorae*), one, *C. choriophylla*, may not belong and is therefore only treated briefly here. This is a very rare and probably extinct Florida endemic tree with distinctly petiolate, thin, strongly toothed, often slightly lobed leaves, 3-5 flowered inflorescences, cream anthers and orange-red fruit. Sargent (1922) doubted that *C. choriophylla* really belongs in series *Parvifoliae*, a doubt which I am endorsing, in which case it is a rare local species or hybrid. *Crataegus* \times *vailiae*, a putative interserial hybrid with series *Macracanthae*, is treated here for convenience, on account of its foliaceous calyx-lobes.

Small stature, rather glandular plants, small \pm unlobed leaves, often uniflorous inflorescences, rather small flowers, \pm foliaceous calyx-lobes as long as or longer than the petals and normally non-anthocyanic anthers, are features that characterize this series. Anther color may in practice be described as white, ivory or cream, representing both degree of precision in observation and some natural variation.

Series *Parvifoliae* is perhaps most closely related to series *Triflorae*, and at least in some specimens, shares the characteristic that flowering shoots are leafy shoots of the season and not permanent woody short shoots. However, the plant

parts are so much smaller than those of *C. triflora*, that even casual confusion is not possible. It is actually with smaller members of series *Lacrimatae* that confusion is most frequent. Members of both series are small to medium-sized xeromorphs that are rather glandular, often hairy and often have yellowish fruit. Series *Lacrimatae*, however, may be immediately distinguished by their zigzag twigs, non-foliaceous calyx-lobes much shorter than petals and fewer styles and nutlets.

KEY TO SPECIES

1. Plants often only 1–2 m tall; leaf-blades \pm elliptic, 1.6:1 or narrower, unlobed; anthers white to cream _____ 1. **C. uniflora**
1. Plants 3–4 m tall at maturity; leaf-blades broad-ovate or broad-obovate, 1.3:1 or broader, larger leaves usually distinctly, though sometimes only shallowly, lobed; anthers anthocyanic or not.
 2. Lobes of leaves obtuse; margins crenate; sides of nutlets smooth _____ 2. **C. brittonii**
 2. Lobes of leaves sharper; margins with sharp, distinct teeth; sides of nutlets \pm eroded _____ 3. **C. \times vailiae**

1. *Crataegus uniflora* Muenchh., *Der Hausvater* 5:147. 1770; non *C. uniflora* Du Roi, *Der Harbkesche Baumzucht*, ed. 1:184. 1771. (**Figs. 1, 2, 3, 4, 7**). TYPE: U.S.A. GEORGIA. Crawford Co.: ca. 2 mi SW of Roberta, 13 Apr 2006, *J.B. Phipps 9060* (NEOTYPE designated here: UWO; ISONEOTYPES: A, BRIT, GA, MO, NCU, US). Muenchhausen's original material would be at LINN according to TL-2 but none could be located of this species.

Crataegus parvifolia Aiton, *Hort. Kew.* 2:169. 1789. TYPE: Specimen labeled '*C. tomentosa* Linn.' with '*tomentosa*' crossed out; no further information except a 'type' label (LECTOTYPE designated here: Banksian Herb., BM).

Crataegus parvifolia var. *florida* Loudon, *Arbor. Frut. Brit.* 2:842 (no Loudon herbarium exists and this variety has not been neotypified; see discussion).

Crataegus parvifolia var. *grossulariaefolia* Loudon, *Arbor. Frut. Brit.* 2:842 (this Loudon variety has also not been neotypified; see discussion).

? *Crataegus bisulcata* Ashe, *Bull. North Carolina Exp. Stn.* 175:112. 1900.

Crataegus earlei Ashe, *Bull. North Carolina Exp. Stn.* 175:112. 1900.

Crataegus grossiserrata Ashe, *Bull. North Carolina Exp. Stn.* 175:112. 1900.

Crataegus raleighensis Ashe, *Bull. North Carolina Exp. Stn.* 175:112. 1900.

Crataegus armentalis Beadle, *Biltmore Bot. Stud.* 1:117. 1902. TYPE: U.S.A. ALABAMA. Marshall Co.: near Albertville, no date, *T.G. Harbison 3281*, fruiting specimen (LECTOTYPE designated here: US).

Crataegus gregalis Beadle, *Biltmore Bot. Stud.* 1:118. 1902. TYPE: U.S.A. NORTH CAROLINA. Buncombe Co.: flats of French Broad River, 18 Sep 1900, *Biltmore Herb. 1270b*, in part (LECTOTYPE designated here: US 969361).

Crataegus pentaneura Ashe, *J. Elisha Mitchell Sci. Soc.* 19:12. 1903.

Crataegus smithii Sarg., *Trees & Shrubs* 2:67. 1903. TYPE: U.S.A. PENNSYLVANIA. Delaware Co.: Lownes Run, Springfield, 21 May 1902, *B.H. Smith 201* (LECTOTYPE designated here: A).

Crataegus trianthophora Sarg., *Trees & Shrubs* 2:11. 1907. TYPE: U.S.A. MISSOURI. Shannon Co.: near Grandin, (lectotype to be designated by Phipps et al., in press).

? *Crataegus croomiana* Sarg., *J. Arnold Arbor.* 3:202. 1922. TYPE: U.S.A. FLORIDA. Leon Co.: near Tallahassee, 15 Apr 1920, *T.G. Harbison 5710* (HOLOTYPE: A).

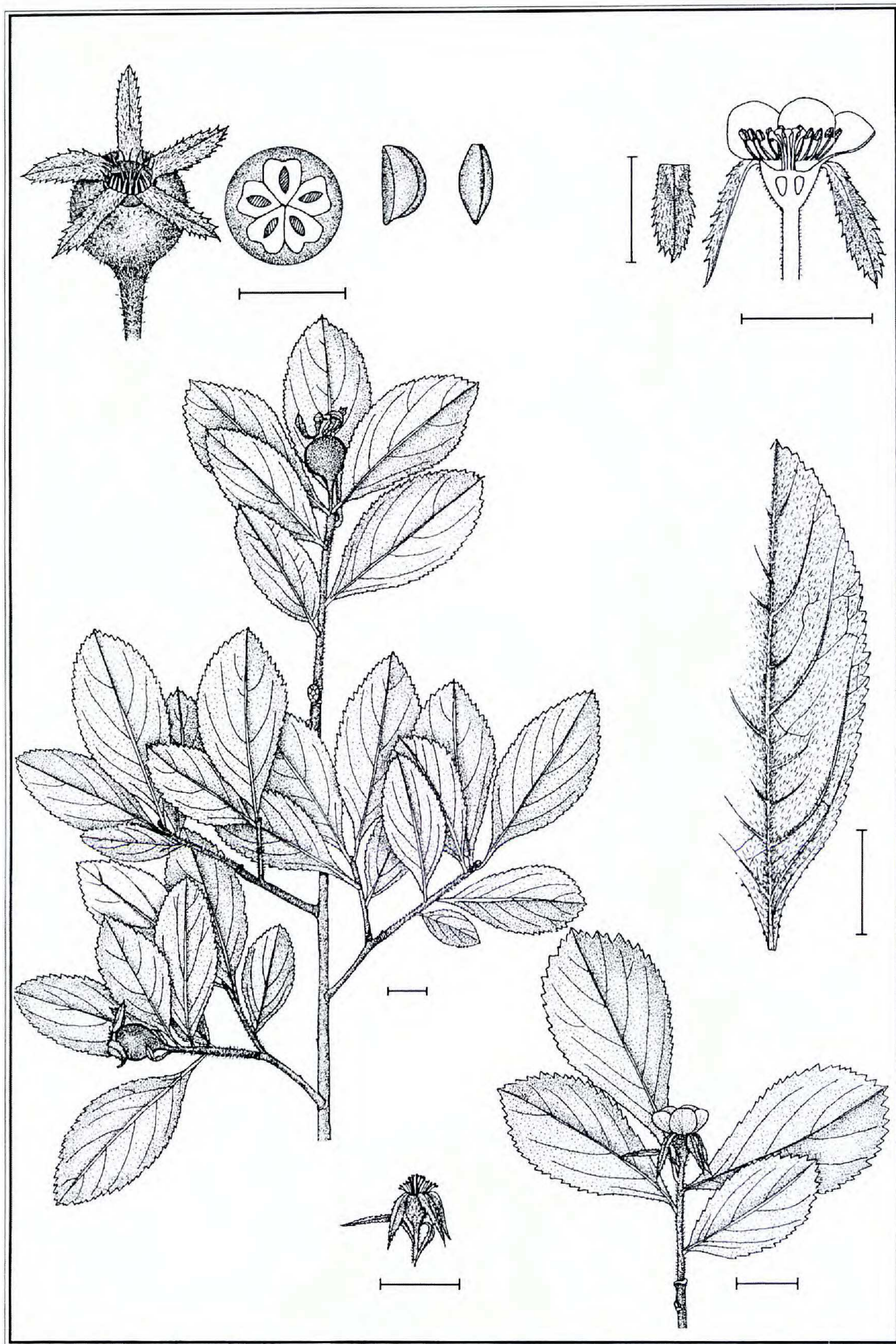


FIG. 1. Typical leaf form in *Crataegus uniflora*. Fruiting specimen, fruit details and leaf magnifications from *Smith 1350* (MO, UWO); flowering shoot and flower details from *Sherman 214* (TENN). S. Laurie-Bourque del.; scale bars = 1 cm.

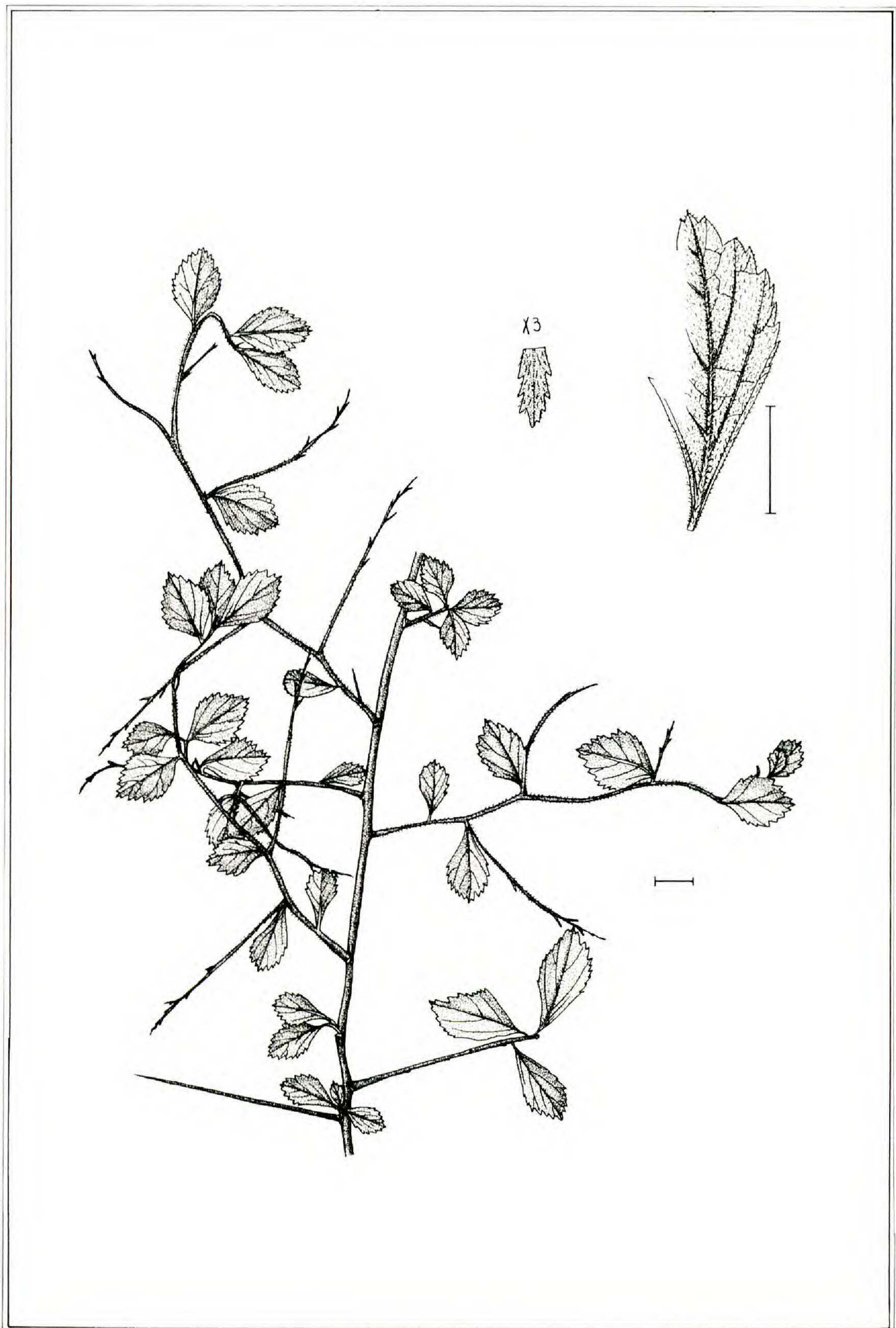


FIG. 2. Young shoots of *Crataegus uniflora* clearly illustrating developing thorns, which possess bract-like appendages; from Chapman s.n. (US). S. Laurie-Bourque del.; scale bars = 1 cm.

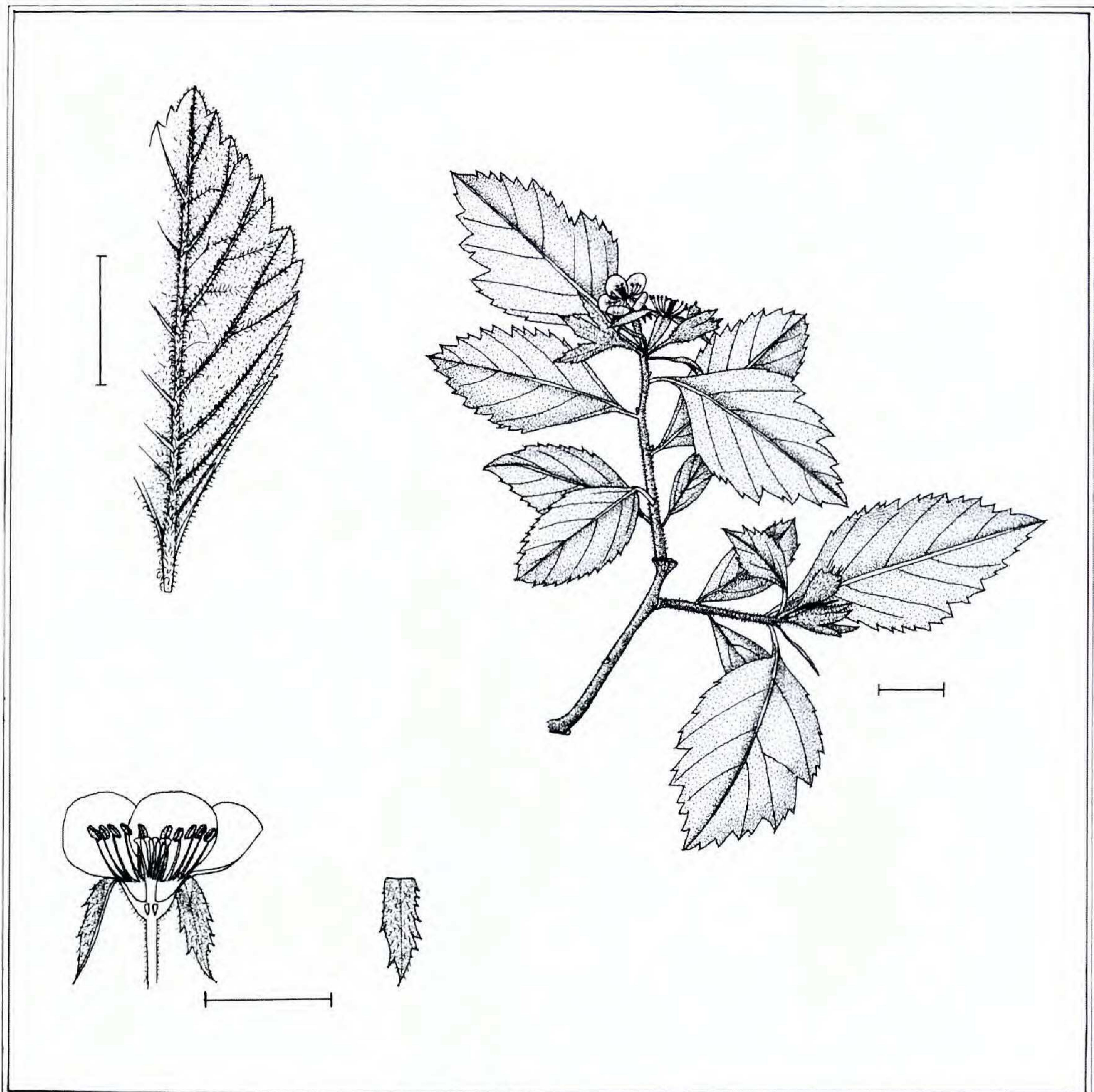


FIG. 3. *Parvifolia*- or *trianthophora*-like form of *C. uniflora* showing several-flowered inflorescence form with pointed leaves; from *Murrill 7 (M0)*. S. Laurie-Bourque del.; scale bars = 1 cm.

Shrubs, us. under 2 m tall at maturity, less commonly to 3 m and occasionally reaching 5 m; extending shoots densely appressed-pubescent; one-year old twigs brown, older grayish; thorns 3-5(-8) cm long, usually plentiful, \pm straight, needle-like, occasionally absent, black at 1 yr old; young thorns commencing as soft, rapidly growing, needle-pointed-shoots with small linear bracts, often curved at first and then straightening out (Fig. 2). Leaves deciduous; petioles very short to lacking, glandular or not; blades (1-)1.5-3(-6) cm long, narrow-elliptic, elliptic, obtrullate, spatulate, oblanceolate or narrowly rhomb-elliptic, occasionally suborbiculate; cuneate at the base, obtuse to broadly acute at the tip; entire; margins crenate to dentate, with variably caducous black gland-tipped teeth though sometimes eglandular even young; venation semi-

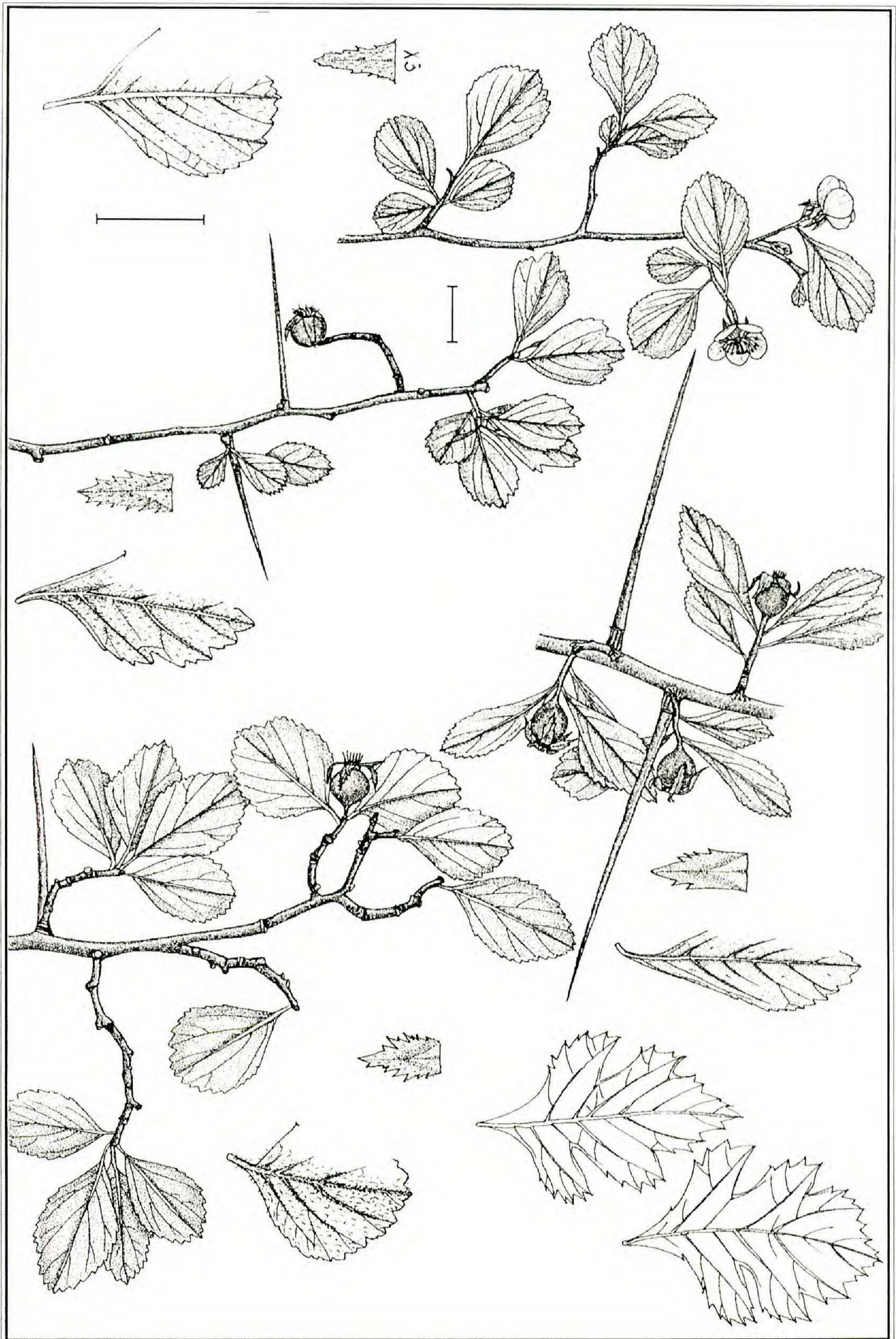


FIG. 4. Various morphotypes of *Crataegus uniflora* sens. lat., showing variation in thorns and leaf-shape as well as lobed leaves with veins to sinuses on extension shoots. From left: somewhat broad-leaved form—Phipps 7677 (UW0); possible *arenicola* form—Shinners 12651 (GA); *C. croomiana* form—Murrill in FLAS 34624; *C. grossiserrata* form with two extension shoot leaves top right—Bozeman 7188 (NCU). S. Laurie-Bourque del.; scale bars = 1 cm.

camptodromous, lateral veins 3-4(-5) per side, \pm impressed; densely scabrous-pubescent above especially when young, below \pm densely pubescent on the veins, thinly to moderately pubescent on the surface; often somewhat glossy above at maturity, \pm coriaceous. Inflorescences 1-3(-5) flowered; pedicels pubescent, bearing us. one or two small, caducous, linear, membranous to herbaceous, gland-margined bracteoles. Flowers 10-15 mm diam.; hypanthium strongly tomentose externally, sometimes bearing a membranous to herbaceous, linear, caducous, gland-margined bracteole; calyx-lobes us. longer than the petals, 2-4 mm wide, \pm foliaceous, narrowly triangular, \pm deeply glandular-serate except in rare aberrant forms, thinly pubescent on both sides; petals \pm circular, white; stamens 20, anthers white to cream, except in rare, possible interserial hybrids; styles 5. Fruit 8-10(-12) mm tall, \pm orbicular, tomentose, yellow-green, yellow, or yellow orange to ruddy; flesh firm, dry or mealy; calyx-lobes to ca. 7 mm long, persistent, conspicuous, patent; nutlets 4-5, dorsally furrowed, laterally smooth.

Common name.—One-flowered hawthorn.

Distribution.—This species is widespread in the southeastern part of the United States (Fig. 7) from Long Island (New York) to eastern Texas with an outlier in Tamaulipas (Mexico). Inland it reaches the line Oklahoma, Missouri, southern Ohio, West Virginia. There is a remarkable disjunction in the Mississippi embayment between trans-Mississippian and cis-Mississippian populations that mirrors a similar pattern in *C. spathulata* (Phipps 1998). *Crataegus uniflora* is usually found in sand barrens and open scrubby woodland.

Crataegus uniflora should be easy to identify on account of its small size, unusually large sepals (relative to the petals), uniflorous or few-flowered inflorescences and yellowish to ruddy fruit. However, it has sometimes been confused with some members of series *Lacrimatae* which include similar sized xeromorphs, also of sand-plains of the southeastern United States as is amplified under the series discussion. Sterile plants can most easily be distinguished from small, sterile plants of *C. berberifolia* Torrey & A. Gray, a superficially similar member of series *Crus-galli*, by the smaller number of lateral veins on the leaves. An interesting feature of this species is the occasional deep lobing of extension-shoot leaves, even narrow ones, with veins to sinuses. The United States National Champion of *C. uniflora* in 1998, from Gainesville, Florida, measured 18 ft tall in 1992, an unusually great stature for this species.

Crataegus uniflora is somewhat variable as befits a common species, in plant size, precise leaf shape (when strikingly obtusate with acute tip or when suborbiculate presenting a quite different facies), number of flowers to an inflorescence (usually one), and anther color (usually ivory to cream). However, 15 specific names listed under series *Parvifoliae* (Palmer 1925), 11 of which are accounted for in this paper, attest to this variation and in some cases may represent valid, perhaps apomictic, microspecies or, as we shall see, perhaps interserial

hybrids. *Crataegus uniflora* had never hitherto been typified perhaps partly because the protologue is unusually diagnostic for one of the period on *Crataegus*. The protologue clearly represents *C. uniflora* as construed here. I have thus neotypified on what I regard as the widespread and common form: a small shrub, with coriaceous, \pm spatulate to narrow obovate leaves, usually numerous fine straight thorns, 1-2 flowered inflorescences, glandular-pectinate sepals, anthers white to cream and yellow-green to yellow-orange fruit. Among this group are some particularly dwarf forms of *C. uniflora* from laterites in Georgia that have been observed with over one hundred flowers when less than 0.3 m tall.

There are two main kinds of deviation from the above norm, firstly, a group where multi (3-6)-flowered inflorescences occur and second, odd forms very like the putatively typical group but with often small and unlobed sepals. We will deal with the multiflowered types first. The most striking of those that can confidently be included in *C. uniflora* is *C. parvifolia* Aiton, lectotypified above, its type with 2-6 flowered inflorescences. A similar form is *C. trianthophora*, nicely illustrated by Faxon in Sargent's protologue, scattered through the range of the species and being the main form of *C. uniflora* in Missouri. Multiflowered forms such as *parvifolia* and *trianthophora* represent one extreme of variation in the *uniflora* complex but the existence of two- and three-flowered inflorescences on some plants makes any varietal recognition dubious at this point. Generally, forms with multiflowered inflorescences have larger and relatively broader leaves than *C. uniflora* but this is not the case with the *parvifolia* complex. Multiflowered specimens with broad and slightly lobed leaves and unpitted nutlets are however, assigned to *C. brittonii*.

The other main kind of variation is exemplified by *C. croomiana* (Figs. 4, 9), whose type comes from Tallahassee, Florida, and which has the distinction of pink anthers and entire to merely glandular-serrate calyx-lobes. Out of the approximately 1200 specimens of the *uniflora* complex that in the UWO database, ten have \pm entire calyx-lobes and come from the northern Florida counties of Alachua, Gadsden, Leon and Liberty. The foliage and non-geniculate twigs are, nevertheless, quite typical for *C. uniflora*. These specimens may be part of the variation that Murrill (1942) noticed. Further investigation is required to see whether *C. croomiana*, plus perhaps some other names, should be upheld, possibly as sporadic interserial hybrids with members of series *Lacrimatae*. *Crataegus bisulcata* from North Carolina has similar calices though 'rounder' leaves while the striking *C. grossiserrata* (Fig. 4) with a type from 'Florida' (no location) also has similar calyx-lobes, though often orbicular (unusual in this series) extension shoot leaves and particularly strong and sharp leaf-teeth. A feature of these broad, extension-shoot leaves is a tendency to deep lobing, sometimes with veins to sinuses. If populations of such forms could be

located today, studied and shown to be worthy of name recognition, they might prove to be the same as the untypified var. *grossulariifolia* of Loudon.

Names listed in the synonymy but so far undiscussed all belong to entities more like typical *C. uniflora* as defined earlier and we present below a table illustrating some of the differences among these and other forms (Table 1). Such is the homonymous *C. uniflora* Du Roi, judging by the protologue obviously the same species as the Muenchhausen one, and is not worth neotypifying. The differences among the remainder are small and apparently not sharp, but it is possible that they represent local, perhaps apomictic, races. The information in this table is taken from protologues, amended by personal observation. Uncommon forms with suborbiculate leaves may be the same as the untypified var. *florida* of Loudon but, as these grade into typical forms, are not considered worthy of recognition.

2. *Crataegus brittonii* Ettl., Bull. Torrey Bot. Club 36:640. 1909. (**Figs. 5, 8**). TYPE: U.S.A. NORTH CAROLINA. Buncombe Co.: Biltmore, 15-18 Sep 1908, W.W. Eggleston 4134 (HOLOTYPE: NY; ISOTYPE: NY).

? *Crataegus arenicola* Ashe, J. Elisha Mitchell Sci. Soc. 17:5. 1900.

? *Crataegus rhodella* Ashe, J. Elisha Mitchell Sci. Soc. 18:19. 1902.

Shrub, slender, to 3 or 4 m tall; thorns 3-5 cm long, often numerous, \pm slender, \pm straight to slightly recurved, blackish; extending shoots pubescent, at one year glabrous, somewhat shiny gray-brown, older becoming gray. Leaves deciduous; petioles 3-6 mm long, flared into the blade, pubescent; blades 2.0-3.5 cm long, elliptic-rhombic to broad elliptic-rhombic in general shape, generally widest near the middle, apex rounded to subacute, bases broad-cuneate; lobes 0-1(-2) per side, if present, shallow, rounded; margins crenate-serrate, the teeth with caducous gland-tips; venation \pm craspedodromous, 3-4 main lateral veins per side; somewhat coriaceous, appressed-pubescent and dark green adaxially, soft pubescent and paler green abaxially; indumentum variably persistent with age. Inflorescences 2-6 flowered; branches dense-pubescent, bearing narrow, gland-bordered bracteoles. Flowers 14-18 mm diam.; hypanthium dense-pubescent; calyx lobes adaxially pubescent, narrow-triangular, margins \pm deeply glandular-serrate; stamens 20, anthers ivory; styles 3-5. Fruit subglobose, ca. 14 mm high, red or ruddy, sometimes ripening to dull brown, pubescent; calyx-lobes reflexed; nutlets 3-5, lateral faces plane, dorsally ridged.

Common name.—Britton hawthorn.

Distribution.—*Crataegus brittonii* is known from North Carolina, Georgia, Tennessee and Alabama. It is found in brushy places.

Ashe's protologue of *C. rhodella*, for which no specimens were actually cited, states that this species comes from western North Carolina, along the Cullasagee River, near Franklin, Macon Co. and the Little Tennessee River, where, although said to be common, it has not been found since that time. Although we have

TABLE 1. Diagnostic features of named forms in *Crataegus* series *Parvifoliae*, from protologues.

	Stature	leaf shape	infl., fl. no.	calyx margins	anther colour	style no.	fruit colour	other
<i>C. arenicola</i>	shrub	ovate-rhomb.	1–5	lacin.	?	?	ruddy	
<i>C. armentalis</i>	0.3–1m	cuneate-spatul.	1–2(–3)	gl.	pale y.	3–5	red	
<i>C. bisulcata</i>	?	rounded	?	nearly entire	?	?	gr.-y.	
<i>C. brittonii</i>	3–4m	ovate to br. ovate	1–6	lacin.	wh.	5	brown	
<i>C. choriophylla</i>	arborescent	obov.-elliptic	3–5	gl.-serrate to .lacin	wh.	4–5	or.-red	thornless
<i>C. croomiana</i>	1.5–2m	obov.-rhomb.	1	nearly ent. to lacerate	pk.	5	?	
<i>C. earlei</i>	shrub	oblanc., obl.-cun.	1	serr.	wh.-cr.	?	?	?
<i>C. gregalis</i>	1–3m	cun., obov.-obl.	1–2(–3)	incised	?	3–5	ruddy	pyriform fruit
<i>C. grossiserrata</i>	small	obov.-spatul.	1	±entire	?	-	?	coarse leaf teeth
<i>C. raleighensis</i>	shrub	obov.-orbic.	1–(2–3)	serr. to lacerate	?	?	yell-gr.	
<i>C. rhodella</i>	to 3m	rhomb., ovate	3–6	gl.-serr	rose-pur.	3–5	ruddy	diam. fls. 18mm
<i>C. smithii</i>	1–2m	obov.	1	gl.serr.	pale y.	5–6	or. to or-gr.	flowers 7–10 days before <i>uniflora</i>
<i>C. trianthophora</i>	0.6–1.2m	obl.-obov.	3	gl.-serr.to -lacin.-	pale y.	3–4	ruddy	
abbreviations used								
	br. = broad	gr. = green	pk. = pink					
	cr. = cream	lacin. = laciniate	pur. = purple					
	cun. = cuneate	obl. = oblong	serr. = serrate					
	ent. = entire	oblanc. = oblanceolate	spat. = spatulate					
	fls. = flowers	obov. = obovate	wh. = white					
	gl. = glandular	or. = orange	y. = yellow					

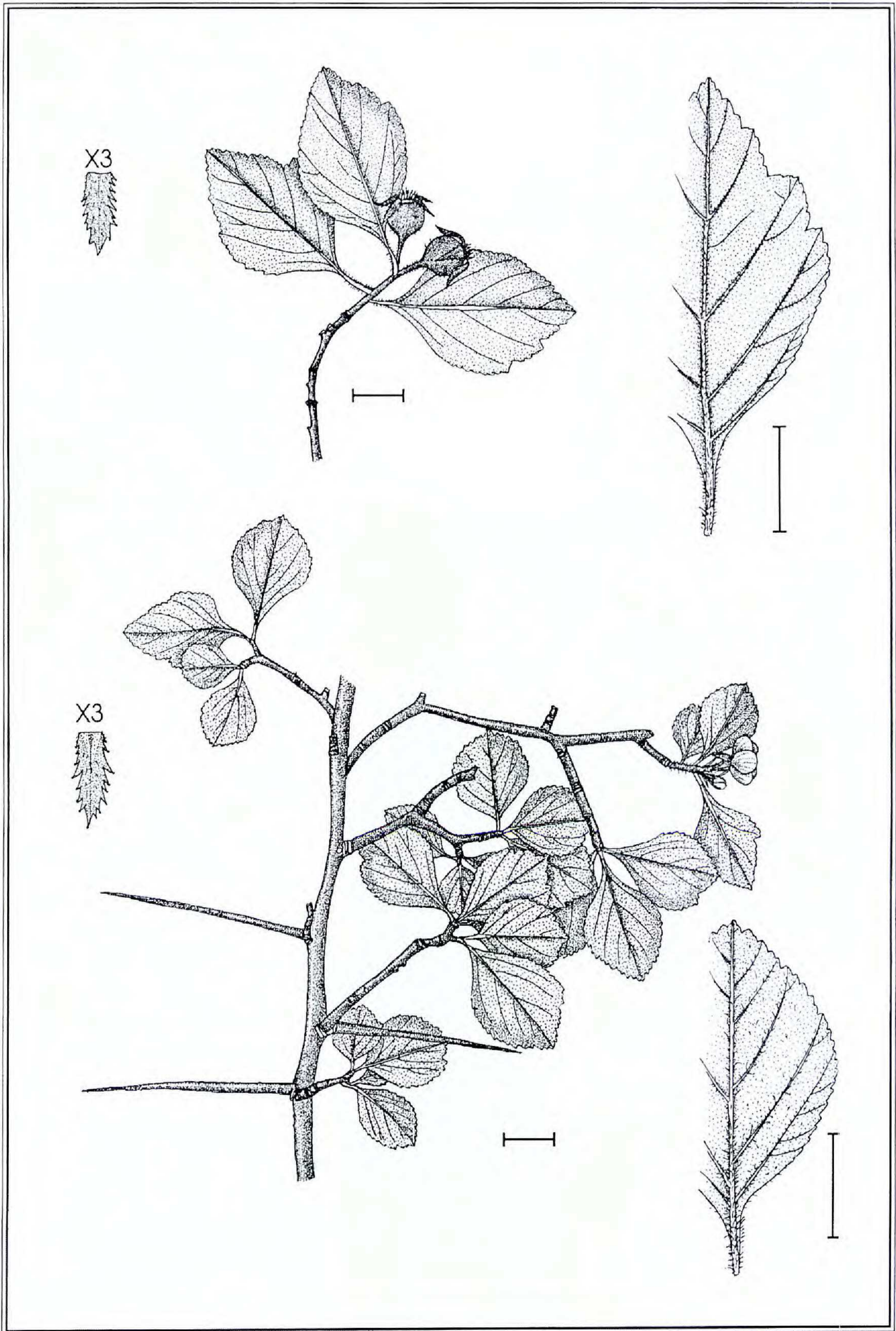


FIG. 5. *Crataegus brittonii* with magnification of calyx-lobes and leaves; fruiting from *Small s.n.* (NY); flowering from *Biltmore Herb. s.n.* (DOV). S. Laurie-Bourque del.; scale bars = 1 cm.

located none of this material, the protologue is sufficiently detailed that *C. rhodella* is likely conspecific with *C. brittonii*, the only significant difference appearing to be anther color (rose in *C. rhodella*) and, if conspecific, *C. rhodella* would become the correct name for the species. Because neither the type of *C. rhodella*, nor any authentic material annotated by Ashe, can be located, however, neotypifying this species is problematical. Two flowering specimens collected by Harbison (*Harbison 11589* and *14999*) from Dillsboro, Jackson Co., North Carolina are labelled *Crataegus rhodella* and with such a prominent collector there is necessarily some presumption that he was correct and that their anthers were pink. However, the label data is silent on anther color and the leaf form resembles *C. ×vailiae*. Pink-anthered *brittonii*-like forms should nevertheless be carefully sought out by those that have the resources to do so. *Crataegus arenicola* appears to be a smaller form of *C. rhodella* but in the absence of authentic material and similar difficulties surrounding neotypification one cannot be sure. A final group of larger plants (also 3–4 m tall) with longer petioles, ovate to broad-ovate leaves with usually sharply toothed margins, also deeply glandular-serrate sepals and somewhat eroded nutlets is sufficiently different that they are referred to the putative interserial hybrid, *C. ×vailiae* Britton, below.

3. *Crataegus ×vailiae* Britton, Bull. Torrey Bot. Club 24:53. 1897. (Figs. 6, 10).

TYPE: U.S.A. VIRGINIA: banks of Roanoke River, 29 May 1890, A. Brown, s.n., T. Hogg, A.M. Vail, M. Timmerman, N.L. Britton and E.G. Britton (LECTOTYPE designated here: NY).

Crataegus missouriensis Ashe, Bull. North Carolina Exp. Stn. 175:100. 1900. TYPE: U.S.A. MISSOURI. Shanon Co.: Montier (NEOTYPE to be designated by Phipps et al. in press).

Crataegus conjungens Sarg., J. Arnold Arbor. 3:200. 1922. TYPE: U.S.A. VIRGINIA. Alleghany Co.: Clifton Forge, 23 May 1919, T.G. Harbison 15078 (=9) (HOLOTYPE: A; ISOTYPE: NCU).

Bushes to 2–4(–5) m tall; thorns to 2.5 cm long; extending twigs densely pubescent, at 1 yr thinly pubescent; at 2 yrs glabrous, dark, shiny blackish-brown to dark gray; older dark gray; mature bark not recorded; thorns absent or 4–6 cm long, few, straight to slightly recurved, somewhat narrow, black at two years. Leaves deciduous; petioles 3–6 mm long, pubescent, occasionally glandular; blades 4–5(–6) cm long, elliptic to rhomb-elliptic in general shape, symmetrical about the middle but sometimes either end widest; subacute at the tip, tapered to a cuneate base; with up to 3 extremely shallow lobes per side; margins with large acute or subacute teeth except near the cuneate base; margins eglandular (on material seen by me), teeth normally sharp; venation craspedodromous with 4–6 veins per side; appressed pubescent above, more obscurely so at maturity, very thin pubescent (glabrescent) on the surface below but veins below persistently dense pubescent; somewhat coriaceous at maturity. Inflorescences 2–8(–12) flowered; branches very dense appressed-pubescent, bearing a few caducous, linear, membranous, gland-margined bracteoles or larger (to 15 × 3 mm) more herbaceous bracteoles in the lower parts; late-flowering.

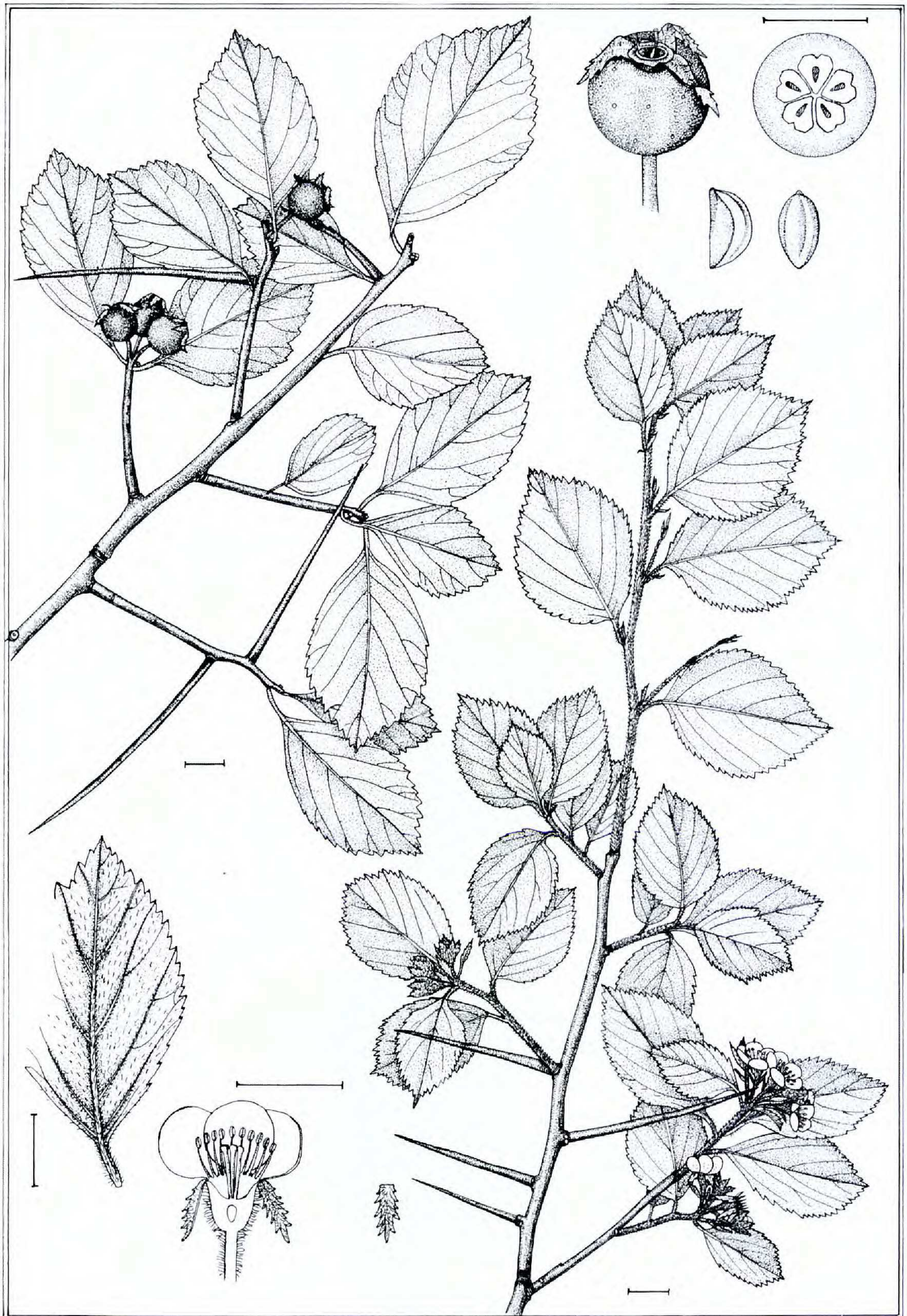


FIG. 6. *Crataegus* × *vailiae* specimens indicating somewhat larger, more acute and more sharply toothed leaves than *C. brittonii*; fruiting from Sargent s.n., 1885 (A); flowering from Harbison 15071 (NCU). S. Laurie-Bourque del.; scale bars= 1 cm.

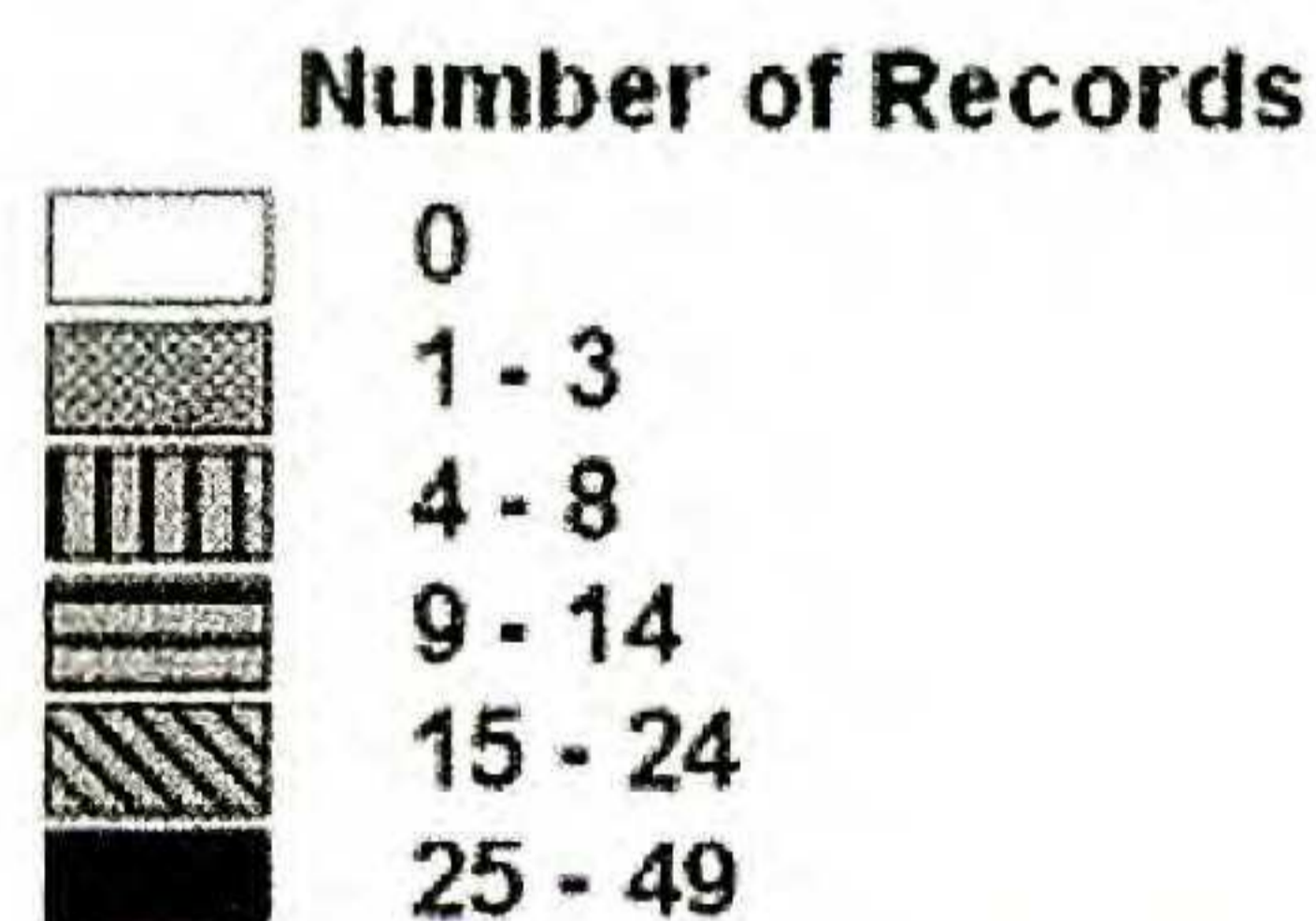
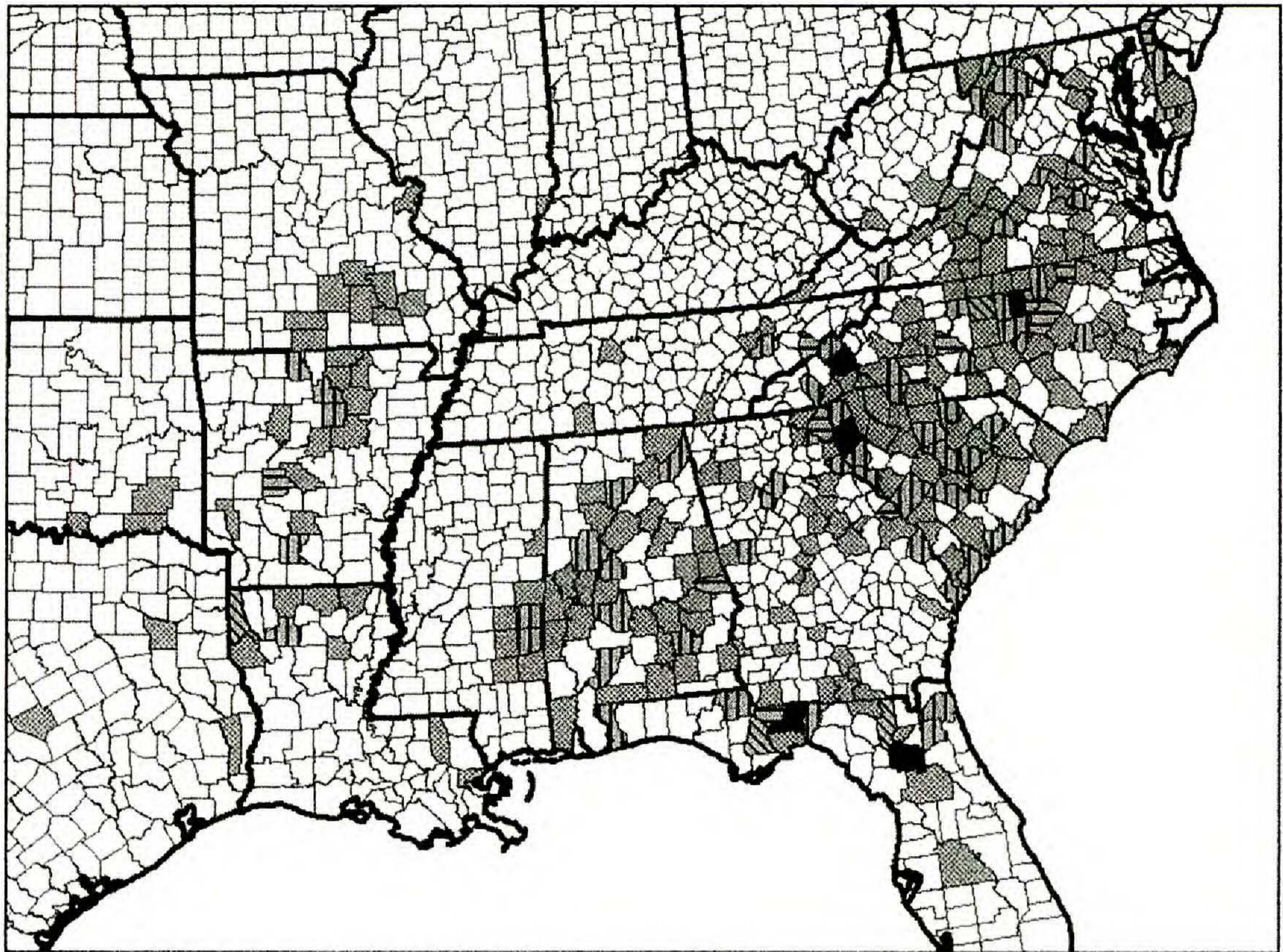


FIG. 7. County level distribution map of *C. uniflora* in the southeastern United States based on 1160 records. Not mapped north of Ohio River or Maryland and Delaware.

Flowers 15–20 mm diam.; hypanthium densely spreading pubescent; calyx-lobes 6–8 mm long, narrowly triangular, somewhat foliaceous, abaxially slightly pubescent, margins deeply glandular-serrate; petals \pm circular, white; stamens 20, anthers cream, pink or red; styles 3–5. Fruit 7–9 mm thick, subglobose, hairy, straw yellow to ruddy at maturity in cultivation at Kew, recorded as deep red and succulent in Missouri (Bush); calyx-lobes long, margins \pm pectinate, reflexed in fruit; nutlets 3–5, dorsally grooved, laterally usually shallowly pitted.

Common name.—Vail's hawthorn.

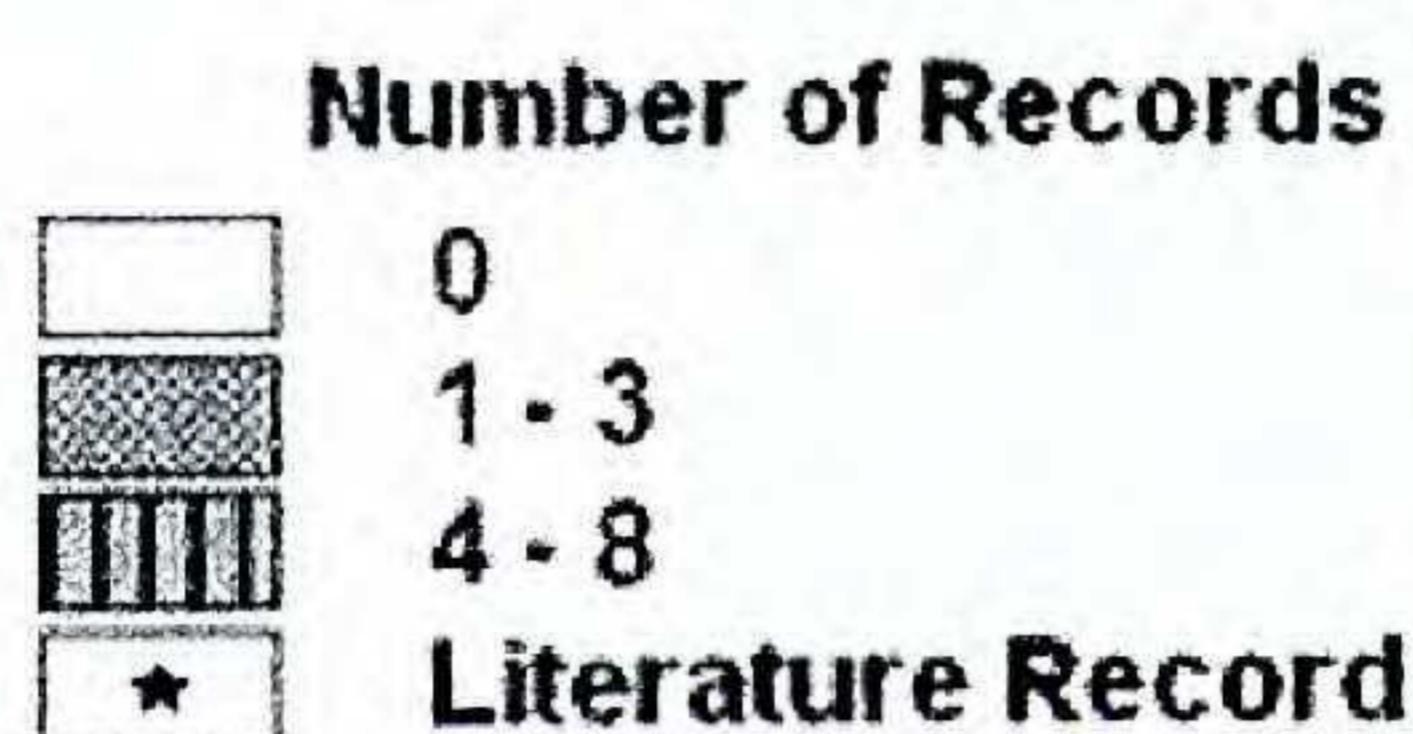
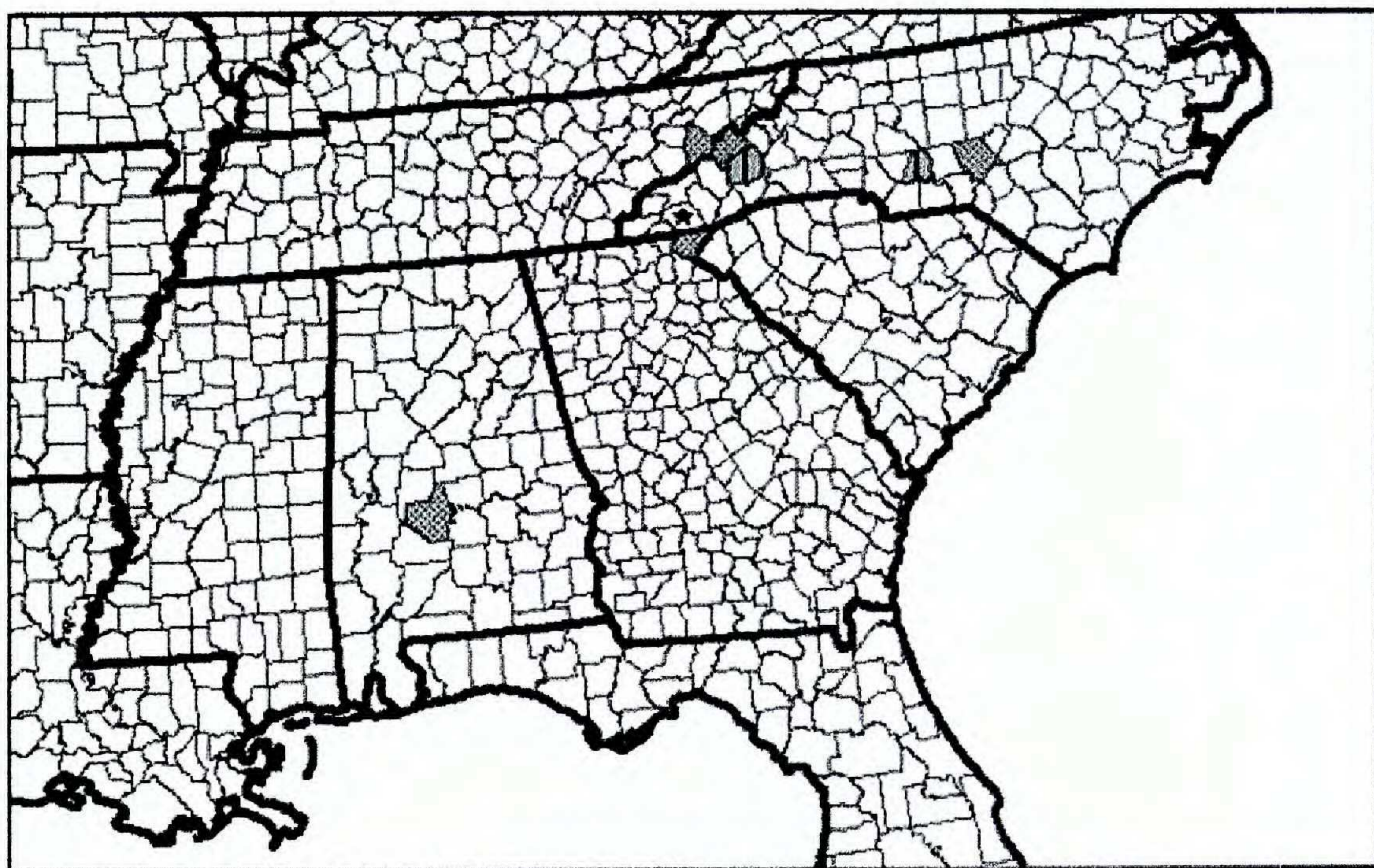
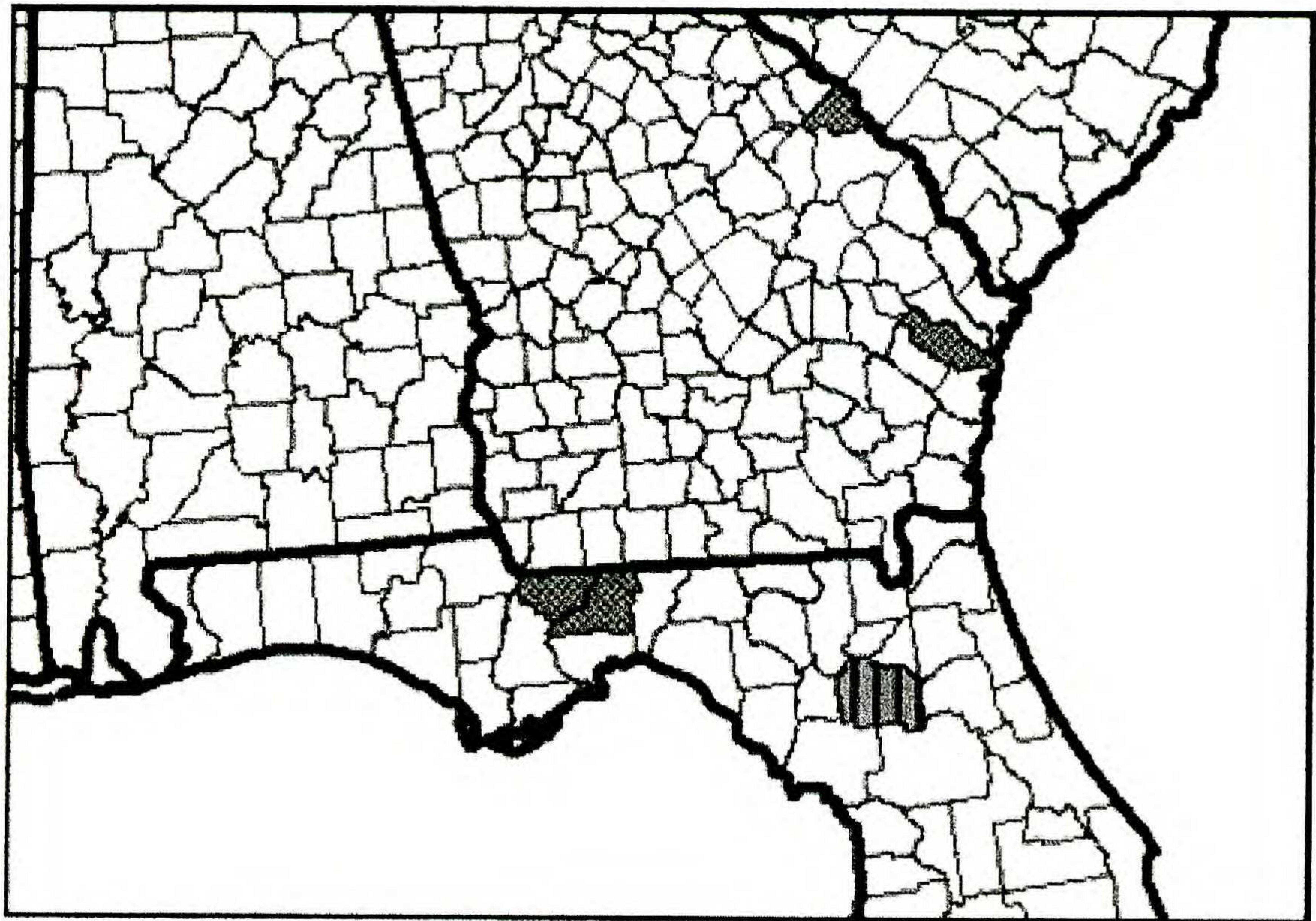


FIG. 8. County level distribution map of *C. brittonii* based on 17 records seen and including literature references for *C. rhodella* from Macon Co., NC.

Distribution.—Vail's hawthorn has a sparse distribution in the United States and is primarily a species of southern Appalachia in Virginia, Tennessee, North Carolina and Georgia. It is also known from Missouri and Arkansas. It occurs in brushy places or on riverbanks.

With its similarities to *C. uniflora*, *C. ×vailiae* may be a hybrid between that species and an entity in series *Macracanthae*, most likely *C. calpodendron*, on account of its laterally eroded nutlets and late anthesis. *Crataegus conjungens* appears to be a smaller form of *C. ×vailiae*.

Vail's hawthorn is an attractive plant in flower and fruit when well grown, especially in forms with reddish fruit, the color nicely set off by the glossy foliage. It is named for Anna Murray Vail, librarian at the New York Botanic Garden, who was one of the collectors of the type material.



Number of Records

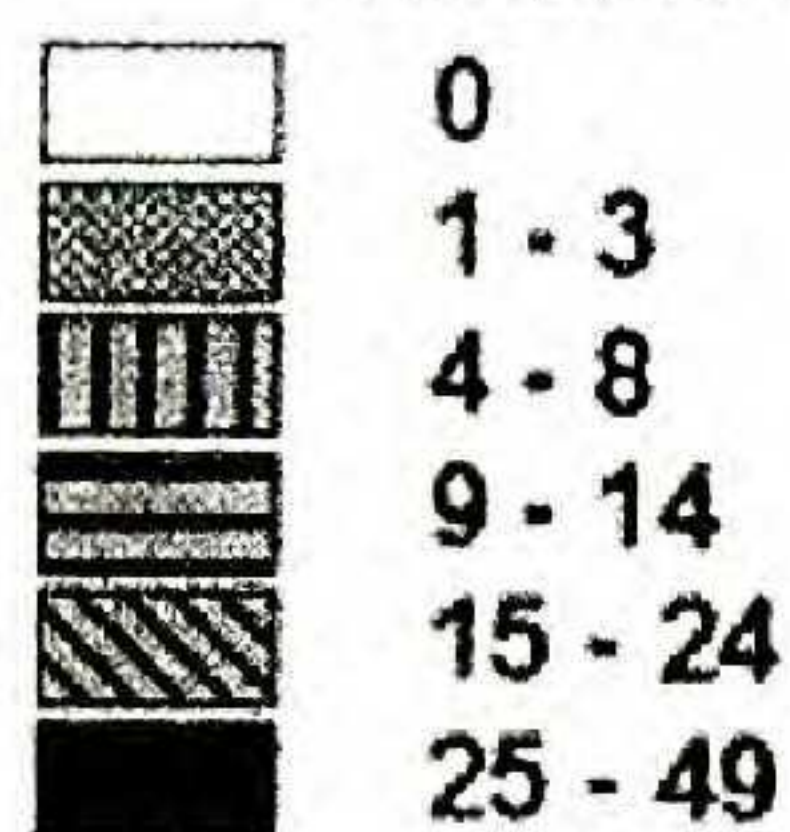
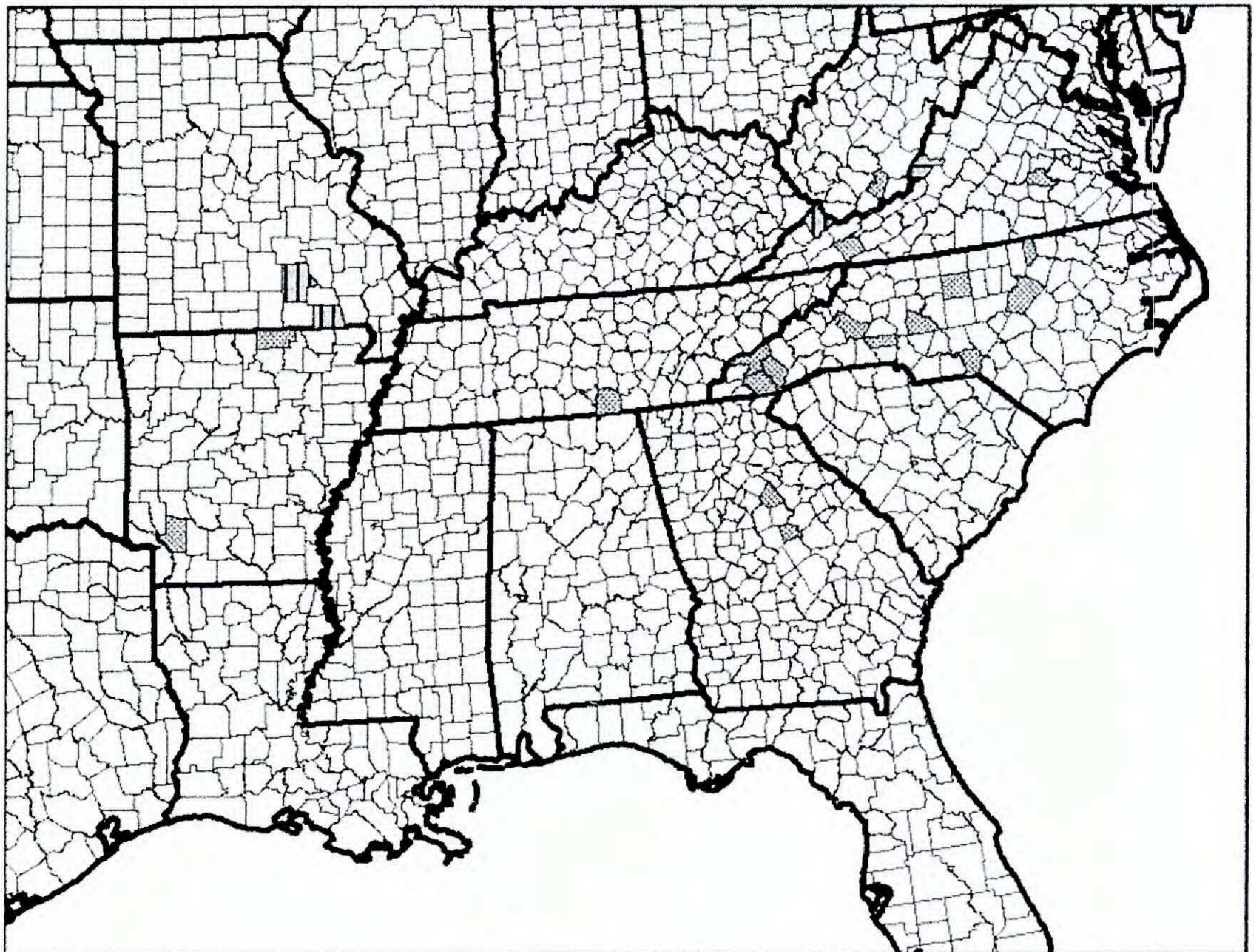


FIG. 9. County level distribution map of *C. croomiana* based on 16 records.

APPENDIX: FURTHER CITED SPECIMENS

Crataegus xvailiae Britton

ARKANSAS. Hempstead Co.: 1905/04/21, Bush, B.F. 14 (HUH). **GEORGIA.** Baldwin Co.: 1914/05/06, Harbison, T.G. 1544 (HUH). Morgan Co.: 1978/05/06, Hill, J.W. 406 (FLAS). **MISSOURI.** Ripley Co.: 1892/07/23, MacKenzie, K.K. 400 (NYBG). Shannon Co.: 1905/05/17, Bush, B.F. 3F (CM). **NORTH CAROLINA.** Burke Co.: 1957/06/11, Bell, C.R. 8759 (NC). Guilford Co.: 1927/06/29, Manning, W.E. and Wiegand, K.E. 1383 (HUH). Jackson Co.: 1901/05/23, Ashe, W.W. 32 (HUH). Lincoln Co.: 1957/06/11, Bell, C.R. 8891 (GA). Macon Co.: 1919/05/10, Harbison, T.G. (A). Richmond Co.: 1954/05/12, Melvin, L. (NCU). Rowan Co.: 1904/05/17, Beadle, C.D. 10103 (NYBG). Swain Co.: 1914/05/18, Harbison, T.G. 1591 (A). Vance Co.: 1874/04, Faxon, C.E. (MO). Wake Co.: 1938/04/25, Godfrey, R.K. 3758 (MO). **VIRGINIA.** Alleghany Co.: 1909/05/19, Eggleston, W.W. 4378 (NYBG). Amelia Co.: 1969/07/24, Johnson, M.F. 3929 (VCU). Buchanan Co.: 1909/10/21, Eggleston, W.W. 5594 (NYBG). Franklin Co.: 1890/05/29, Brown, H.A. et al (NYBG). **WEST VIRGINIA.** Summers Co.: 1933/05/13, Boone, W. 564 (WVU).



Number of Records

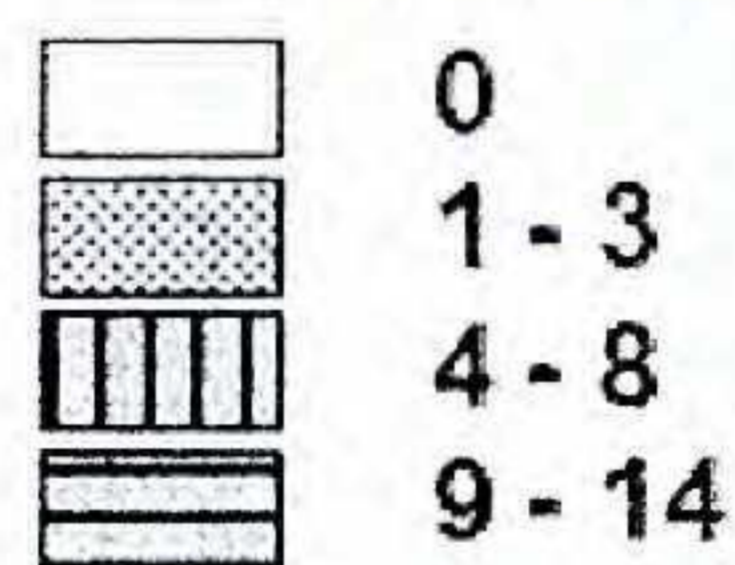


FIG. 10. County level distribution map of *C. × vailiae* based on 39 records.

Crataegus brittonii Ettl.

GEORGIA. Rabun Co.: 1893/08/04, Small, J.K. (NY). **NORTH CAROLINA.** Buncombe Co.: 1934/05/26, Palmer, E.J. 42550 (NY). Madison Co.: 1908/09/21-22, Eggleston, W.W. 4162 (NY). Stanley Co.: 1909/10/24, Eggleston, W.W. 5615 (NY). **TENNESSEE.** Cocke Co.: 1897/08/24, Kearney, T.H., Jr. 596 (NY).

Crataegus uniflora Muenchh.

ALABAMA. Bibb Co.: 1977/04/14, Sessler, A.H. 1004 (ALU). Blount Co.: 1966/06/28, Clark, R.C. and Hare, T.B. 4077 (NCU). Bullock Co.: 1967/07/19, Clark, R.C. 16433 (NCU). Chambers Co.: 1967/06/02, Clark, R.C. 13470 (NCU). Choctaw Co.: 1964/04/20, McDaniel, S. 4222 (IBE). Coffee Co.: 1967/07/04, Clark, R.C. 15618 (NCU). Covington Co.: 1967/06/20, Clark, R.C. 14402 (NCU). Crenshaw Co.: 1931/04/16, Palmer, J.P. 38686 (MO). Cullman Co.: 1891/06/13, Sudworth, G.B. (US). Dallas Co.: 1920/04/19, Harbison, T.G. 15275 (NCU). DeKalb Co.: 1955/05/06, Churchill, J.A. (MSC). Escambia Co.: 1969/04/18, Harmon, C. 046 (NCU). Greene Co.: 1966/08/06, Clark, R.C. 6954 (NCU). Hale Co.: 1966/06/07, Will-

iams, N. 337 (ALU). **Henry Co.:** 1966/07/28, Clark, R.C. 6141 (NCU). **Jackson Co.:** 1899/06/18, Harbison, T.G. (NCU). **Jefferson Co.:** 1899/06/02, General 453 (A). **Lee Co.:** 1897/08/11, Earle, F.S. (MO). **Lowndes Co.:** 1982/10/03, Gunn, S.C. 1366 (AUA). **Macon Co.:** 1969/04/29, Freeman, J.D. 695 (AUA). **Marengo Co.:** 1967/06/05, Clark, R.C. 13644 (NCU). **Marshall Co.:** 1977/04/23, Ross, L. 107 (ALU). **Mobile Co.:** 1898/04/15, Mohr, C. (ALU). **Monroe Co.:** 1959/06/15, Grelen, H. (FLAS). **Montgomery Co.:** 1880/07/15, Mohr, C. (US). **Perry Co.:** 1967/08/10, Clark, R.C. 17835 (NCU). **Pike Co.:** 1931/04/15, Palmer, E.J. 38656 (MO). **Randolph Co.:** 1967/04/16, Clark, R.C. 11365 (NCU). **St. Clair Co.:** 1951/06/24, Hollis, C.G. (ALU). **Sumpter Co.:** 1966/06/06, Drapalik, D. 1362 (NCU). **Talladega Co.:** 1966/06/20, Clark, R. and Heard, T.A. 2895 (NCU). **Tallapoosa Co.:** 1973/10/06, Pringle, G. 072 (UNA). **Tuscaloosa Co.:** 1982/10/07, Burckhalter, R. 015 (UNA). **Walker Co.:** 1967/05/08, Clark, R.C. 12564 (NCU). **Winston Co.:** 1967/05/10, Clark, R.C. 12995 (NCU). **ARKANSAS. Cleburne Co.:** 1967/09/06, Demaree, D. 56271 (IBE). **Dallas Co.:** 1975/07/05, Sparkman 69902 (IBE). **Faulkner Co.:** 1924/10/13, Palmer, E.J. 26535 (A). **Fulton Co.:** 1909/05/21, Bush, B.F. 5690 (A). **Garland Co.:** 1925/04/23, Palmer, E.J. 26885 (A). **Howard Co.:** 1909/10/07, Kellogg, J.H. (A). **Independence Co.:** 1968/06/24, Thomas, D. 9093 (NLU). **Izard Co.:** 1929/04/27, Palmer, E.J. 35547 (A). **Marion Co.:** 1914/06/14, Palmer, E.J. 5974 (A). **Ouachita Co.:** 1975/08/06, Demaree, D. 69628 (IBE). **Pope Co.:** 1932/09/20, Merrill, G. 36 (A). **Saline Co.:** 1972/07/15, Demaree, D. 65241 (IBE). **Sharp Co.:** 1970/07/24, Thomas, D. 15255 (NLU). **Stone Co.:** 1971/09/18, Demaree, D. 64280 (IBE). **White Co.:** 1887/07/23, Coville, F.V. 171 (US). **DELAWARE. Kent Co.:** 1941/05/09, Tatnall, R.R. 4836 (DOV). **New Castle Co.:** 1930/05/30, Tatnall, R.R. 896 (DOV). **Sussex Co.:** 1902/09/12, Norton, J.B.S. (MARY). **District of Columbia:** 1889/05/18, Burgess, E.S. (MARY). **FLORIDA. Alachua Co.:** 1982/03/14, Easterday, J.C. 821 (USF). **Clay Co.:** 1869/03, Canby, W.M. (US). **Columbia Co.:** 1895/07/11-19, Nash, V. (A). **Duval Co.:** 1894/07/09, Curtiss, A.H. 4553 (US). **Escambia Co.:** 1949/04/15, Hood, S.C. 1915 (FLAS). **Franklin Co.:** 1923/09/27, Harbison, T.G. 6046 (A). **Gadsden Co.:** 1966/04/30, McDaniel, S. 7407 (IBE). **Hamilton Co.:** 1900/04/17, Hugar, A. (MO). **Jackson Co.:** 1929/04/12, Palmer, E.J. 35299 (US). **Jefferson Co.:** 1950/09/30, Kruz, H. (FSU). **Leon Co.:** 1920/10/06, Harbison, T.G. 5710 (A). **Liberty Co.:** 1957/05/10, Uttal, J.L. 5382 (LYN). **Marion Co.:** 1985/07/18, Hansen, B.F., Van Etten, M. and Wunderlin R.P. 9981 (USF). **Polk Co.:** 1985/06/12, Hopkins, S. 3410 (FLAS). **Union Co.:** 1939/08/18, Murrill, W.A. (FLAS). **Wakulla Co.:** 1964/06/21, Godfrey, R.K. 64178 (FSU). **GEORGIA. Bartow Co.:** 1971/08/01, Waters, J.C. 136 (AUA). **Berrien Co.:** 1973/05/06, McCarty, T. (MO). **Bibb Co.:** 1901/05/26, No Collector (MO). **Brooks Co.:** 1966/07/13, Faircloth, W.R. 3465 (MO). **Burke Co.:** 1938/04/10, McVaugh, R. and Byron, J.H. 2470 (GA). **Chatham Co.:** 1958/06/17, Duncan, W.H. 21113 (DHL). **Clarke Co.:** 1929/03/12, Dunnaway, J.M. E7433 (GA). **Clay Co.:** 1966/07/26, Bozeman, J.R. 6614 (NCU). **Cobb Co.:** 1943/05/02, Wurdack, J. (CM). **Decatur Co.:** 1900/06/20, Sargent, C.S. (A). **DeKalb Co.:** 1966/06/25, Wood, A. (GA). **Dougherty Co.:** 1900/08/13, Maxon, W.R. and Pollard, C.L. 505 (US). **Echols Co.:** 1965/07/16, Dean, R. and Faircloth, W.R. 2297 (GA). **Elbert Co.:** 1977/09/10, Coile, N.C. 1424 (GA). **Floyd Co.:** 1956/08/09, Lipps, L. 957 (TENN). **Glascokk Co.:** 1966/07/15, Faircloth, W.R. 3499 (MO). **Greene Co.:** 1939/08/13, Duncan, W.H. 1585 (GA). **Gwinnett Co.:** 1908/04/12, Allard, H.A. 106 (US). **Habersham Co.:** 1914/05/06, Ashe, W.W. (NCU). **Hancock Co.:** 1966/08/09, Bozeman, J.R. 7314 (NCU). **Hart Co.:** 1942/04/26, Duncan, W. 4846 (GAM). **Houston Co.:** 1979/06/01, Dixon, D. 1409 (NLU). **Jackson Co.:** 1948/04/30, Cronquist, A. 5085 (US). **Jones Co.:** 1966/08/08, Bozeman, J.R. 7188 (NCU). **Lanier Co.:** 1965/07/30, Faircloth, W.R. and Norsworthy, J. 2603 (NCU). **Liberty Co.:** 1916/09/09, Harbison, T.G. (A). **Lowndes Co.:** 1973/05/17, McCarty, T. (MO). **Macon Co.:** 1898/10/02, Canby, W.M., Muir, J. and Sargent, C.S. (DOV). **Meriwether Co.:** 1945/04/17, Henry, M.G. 3982 (GA). **Morgan Co.:** 1979/04/22, Hill, L. W848 (GA). **Oglethorpe Co.:** 1968/05/04, Montgomery, F. 1025 (GA). **Peach Co.:** 1966/07/02, Clark, J.V. (GA). **Putnam Co.:** 1942/04/30, Duncan, W.H. 4913 (GA). **Rabun Co.:** 1893/08/07, Small, J.K. (MO). **Richmond Co.:** 1900/04/25, Cuthbert, A. 11 (DOV). **Screven Co.:** 1948/04/17, Cronquist, A. 5004 (GA). **Stephens Co.:** 1975/07/21, Boufford, D.E. and Wood, E.W. 2096 (NCU). **Sumpter Co.:** 1940/05/11, Duncan, W.H. 2342 (GH). **Troup Co.:** 1829/06/12, Sargent, C.S. (A). **Turner Co.:** 1947/11/05, Thorne, R.F. 7509 (GA). **Washington Co.:** 1970/06/26, Hobbs, G.B. and Lipscomb, H. 52 (NCU). **ILLINOIS. Wabash Co.:** 1875, Schneck, D. (MO). **KENTUCKY. Boyd Co.:** 1923/05/20, Horsey, R.E. 1662 (A). **Pulaski Co.:** 1939/09/08,

Brown, E.L. 2637 (A). **LOUISIANA. Bienville Parish:** 1967/06/07, *Thieret, J.W.* 26568 (LAF). **Caddo Parish:** 1969/06/15, *Thieret, J.W.* 31277 (LAF). **Caldwell Parish:** 1973/06/02, *Marx, P. et al* 1207 (NLU). **Claiborne Parish:** 1975/04/26, *Haynes, R.R.* 4807 (ALU). **Desoto Parish:** 1979/11/10, *Dixon, D.* 2526 (NLU). **Morehouse Parish:** 1972/05/04, *Thomas, D.R.* 28684 (NLU). **Orleans Parish:** 1916/04, *Cocks, R.S.* (NO). **Rapides Parish:** 1976/06/18, *Shultz, C.J. and S.E.* 142 (NLU). **Tangipohoa Parish:** 1901/09/01, *Cocks, R.S.* (NO). **Union Parish:** 1983/07/23, *Moore, D.C.* 1670 (NLU). **MARYLAND. Allegany Co.:** 1940/06/12, *Norton, J.B.S.* (MARY). **Caroline Co.:** 1928/06/03, *Tatnall, R.R.* 78 (DOV). **Montgomery Co.:** 1918/09/29, *Hunnewell, F.W.* 5661 (GH). **Washington Co.:** 1906/07/11, *Jones, W.R. and Shreve, F.* 689 (US). **Wicomico Co.:** 1903/06/06, *Norton, J.B.S.* (MARY). **Worcester Co.:** 1940/06/24, *Jeffery, W.F. and Norton, J.B.S.* (MARY). **MISSISSIPPI. Clarke Co.:** 1967/09/09, *Jones, S.B. and Jones, C.* 15241 (NCU). **Jasper Co.:** 1961/08/20, *McDaniel, S.* 2689 (IBE). **Jones Co.:** 1978/06/03, *Morgan, D.* 678 (IBE). **Kemper Co.:** 1859/05/01, *Holgand, E.* (MO). **Lauderdale Co.:** 1922/04/18, *Harbison, T.G.* 6043 (A). **Lowndes Co.:** 1973/05/02, *Holmes, W.C.* 1701 (NATC). **Newton Co.:** 1961/07/22, *McDaniel, S.* 2627 (IBE). **Wayne Co.:** 1967/04/12, *Bass, C., Jones, S.B., Prescott, V. and Reynolds, J.D.* 11631 (GA). **MISSOURI. Carter Co.:** 1893/05/16, *Eggert, H.* (MO). **Dent Co.:** 1927/09/06, *Kellogg, J.* (MO). **Douglas Co.:** 1934/08/19, *Steyermark, J.* 14705 (MO). **Ozark Co.:** 1928/06/28, *Palmer, E.J.* 34812 (GH). **Reynolds Co.:** 1934/09/28, *Steyermark, J.A.* 15577 (MO). **Shannon Co.:** 1978/05/18, *Summers, B.* 396 (MO). **St. Louis Co.:** 1879/09/16, *Engelman, G.* (MO). **Texas Co.:** 1934/08/15, *Steyermark, J.A.* 14530 (MO). **Wayne Co.:** 1893/06/22, *Eggert, H.* 5335 (CM). **NEW JERSEY. Burlington Co.:** 1955/08/18, *Churchill, J.A.* (MSC). **Cape May Co.:** 1917/07/15, *Killip, E.P.* 2406 (US). **Cumberland Co.:** 1964/07/27, *Gillis, W.T.* 5646 (MSC). **Monmouth Co.:** 1976/06/24, *Schwenk, J.* (MO). **Salem Co.:** 1874/07/04, *Redfield, J.H.* 1902 (MO). **NEW YORK. Cattaraugus Co.:** 1895/07/17, *Andrews, E.F.* (AUA). **Richmond Co.:** 1879/08/22, *Schrenk, J.* (MO). **Suffolk Co.:** 1879/06/03, *LSK* (MO). **NORTH CAROLINA. Alamance Co.:** 1956/09/29, *Hammond, A.E. and Ramseur, G.S.* 2254 (NCU). **Alexander Co.:** 1935/05/08, *Verrhoof, O.* (NCSC). **Anson Co.:** 1956/09/21, *Ahles, H.E. and Leisner, R.S.* 19469 (NCU). **Bladen Co.:** 1948/06/10, *Fox, W.B. et al* 1705 (NCSU). **Brunswick Co.:** 1954/08/01, *Melvin, L.* (NCU). **Buncombe Co.:** 1908/09/15, *Eggleston, W.W.* 4129 (US). **Burke Co.:** 1958/09/09, *Bell, R.C.* 15054 (NCU). **Carteret Co.:** 1923/06/30, *Holmes, J.S.* (NCU). **Caswell Co.:** 1958/05/22, *Bell, R.C.* 11893 (NCU). **Catawba Co.:** 1891/06/25, *Heller, A.A. and Small, J.K.* (US). **Chatham Co.:** 1988/05/19, *Swab, E.C.* 162 (USCH). **Chowan Co.:** 1898/07/29, *Kearney, T.Jr.* 1903 (US). **Cleveland Co.:** 1956/06/22, *Ahles, H.E. and Leisner, R.S.* 15253 (NCU). **Craven Co.:** 1919/05/26, *Harbison, T.G.* 15090 (NCU). **Cumberland Co.:** 1957/05/04, *Ahles, H.E. and Hammond, A.* 24389 (NCU). **Davidson Co.:** 1916/06/07, *Totten, H.R.* (NCU). **Davie Co.:** 1916/06/08, *Totten, H.R.* (NCU). **Durham Co.:** 1932/08/02, *Blomquist, H.L.* 183 (US). **Forsyth Co.:** 1948/09/07, *Correll, D.S. and Correll, H.B.* 14478 (DUKE). **Franklin Co.:** 1956/07/10, *Ahles, H.E. and Leisner, R.S.* 16508 (NCU). **Gaston Co.:** 1956/09/17, *Ahles, H.E. and Leisner, R.S.* 18810 (NCU). **Granville Co.:** 1956/05/22, *Ahles, H.E. and Bell, C.R.* 12756 (NCU). **Greene Co.:** 1934/05/12, *Totten, H.R.* (NCU). **Guildford Co.:** 1953/05/12, *Melvin, L.* (NCU). **Halifax Co.:** 1956/07/19, *Ahles, H.E. and Leisner, R.S.* 16975 (NCU). **Harnett Co.:** 1956/09/29, *Laing, H.* 349 (NCU). **Henderson Co.:** 1962/08/21, *Pittillo, D.* 546 (GA). **Hertford Co.:** 1958/07/08, *Ahles, H.E. and Duke, J.A.* 46018 (NCU). **Iredell Co.:** 1958/05/18, *Ahles, H.E. and Britt, R.* 41050 (NCU). **Jackson Co.:** 1940/07/15, *Totten, H.R.* (NCU). **Johnston Co.:** 1919/04/26, *Harbison, T.G.* 14967 (NCU). **Jones Co.:** 1954/08/08, *Corbin and Wyatt* (NCU). **Lee Co.:** 1955/06/27, *Kessler, P.-A.* 350 (NCU). **Lenoir Co.:** 1908/10/12, *Eggleston, W.W.* 4279 (US). **Lincoln Co.:** 1957/06/11, *Bell, R.C.* 8907 (NCU). **Madison Co.:** 1908/09/21, *Eggleston, W.W.* 4158 (CM). **Mecklenburg Co.:** 1958/10/02, *Ahles, H.E. and Duke, J.A.* 49968 (NCU). **Montgomery Co.:** 1970/05/18, *Wells, E.F.* 2888 (NCU). **Moore Co.:** 1900/08/20, *Ashe, W.W.* (CM). **New Hanover Co.:** 1963/06/30, *Ahles, H.E. and McCrary, A.* 537 (NCU). **Northampton Co.:** 1958/07/07, *Ahles, H.E. and Duke, J.A.* 45726 (NCU). **Orange Co.:** 1969/08/08, *Whigham, D.* 1251 (NCU). **Person Co.:** 1951/07/31, *Batson, W.T. Jr.* 749 (DUKE). **Pitt Co.:** 1956/05/09, *Eason, M.* 20 (NCU). **Polk Co.:** 1921/08/11, *Peattie, D.C.* 1163 (NCU). **Randolph Co.:** 1965/10/10, *Harper, F.H. and Harper, J.S.* 4187 (NCU). **Rockingham Co.:** 1956/07/07, *Radford, A.E.* 13628 (NCU). **Rowan Co.:** 1908/09/12, *Eggleston, W.W.* 4105 (CM). **Rutherford Co.:** 1956/08/30, *Melvin, L.* 5007 (NCU). **Scotland Co.:** 1937/05/03, *Coker, W.C.* (NCU). **Stanly Co.:** 1891/08/18, *Heller, A.A. and*

Small, J.K. 49 (MO). **Stokes Co.:** 1958/07/26, *Radford, A.E.* 37727 (NCU). **Transylvania Co.:** 1961/07/05, *Rodgers, C.L.* 61328 (DUKE). **Vance Co.:** 1956/10/01, *Ahles, H.E. and Leisner, R.S.* 20430 (NCU). **Wake Co.:** 1964/07/14, *Sawyer, G.P. Jr.* 1256 (USCH). **Warren Co.:** 1968/06/12, *O'Briant, S. and Radford, A.E.* 45482 (ALU). **Washington Co.:** 1958/06/15, *Radford, A.E.* 35225 (NCU). **Wayne Co.:** 1957/05/03, *Radford, A.E.* 22009 (NCU). **Wilkes Co.:** 1938/06/13, *Stewart, S.C. and Stewart, L.* (NCU). **OKLAHOMA. Choctaw Co.:** 1850s-1900s, *Edwards, J.E.* (GH). **Garrett Co.:** 1905/06/08, *Shreve, F.* 483 (US). **Marshall Co.:** 1963/06/19, *Ware, G.* (NATC). **Pusmataha Co.:** 1931/05/26, *Palmer, E.J.* 39406 (MO). **PENNSYLVANIA. Clinton Co.:** 1895/06/10, *Glatfelter, N.M.* (MO). **Delaware Co.:** 1903/05/20, *Graves, J.A.* (MO). **North Hampton Co.:** 1891/08/03, *Porter, T.C.* (US). **SOUTH CAROLINA. Abbeville Co.:** 1957/06/29, *Radford, A.E.* 25986 (NCU). **Aiken Co.:** 1898/08/06, *Eggert, H.* (MO). **Allendale Co.:** 1953/04/06, *Batson, W.T. and Kelley, W.R.* (USCH). **Anderson Co.:** 1809/07/24, *Davis, J.* (CM). **Barnwell Co.:** 1952/06/13, *Batson, W.T. and Kelley, W.R.* (USCH). **Beaufort Co.:** 1917/04/29, *Churchill, J.R.* (MO). **Calhoun Co.:** 1957/05/19, *Ahles, H.E. and Haesloop, J.G.* 25520 (NCU). **Charleston Co.:** 1957/05/20, *Ahles, H.E. and Haesloop, J.G.* 25769 (NCU). **Cherokee Co.:** 1957/09/18, *Ahles, H.E.* 34428 (TENN). **Chester Co.:** 1957/06/27, *Bell, R.C.* 9536 (NCU). **Clarendon Co.:** 1914/05/22, *Stone, W.* 271 (A). **Colleton Co.:** 1983/04/04, *Rayner, D.A.* 1593 (USCH). **Darlington Co.:** 1941/05/15, *Smith, B.E.* 947 (USCH). **Edgefield Co.:** 1957/05/12, *Radford, A.E.* 22648 (NCU). **Fairfield Co.:** 1983/06/22, *Gould, B., LaBorde, O. and Pugh, A.E.* (NLU). **Florence Co.:** 1982/04/24, *McFarlane, B.* 1191 (USCH). **Greenville Co.:** 1934/09/20, *Wherry, E.T.* (A). **Horry Co.:** 1957/09/12, *Totten, H.R.* 1576 (DHL). **Jasper Co.:** 1954/04/19, *Ahles, H.E.* 7807 (NCU). **Kershaw Co.:** 1960/05/25, *Herring, W.A.* 3 (USCH). **Lancaster Co.:** 1975/05/10, *Boufford, D.E.* 15999 (CM). **Laurens Co.:** 1991/07/09, *Horn, C.N. and Mytko, D.E.* 4564 (USCH). **Lee Co.:** 1957/06/06, *Radford, A.E.* 24320 (NCU). **Lexington Co.:** 1934/05/19, *Palmer, E.J.* 42423 (MO). **McCormick Co.:** 1960/10/14, *McComb, C.* 65 (GA). **Newberry Co.:** 1957/06/25, *Bell, R.C.* 9186 (NCU). **Oconee Co.:** 1942/05/09, *Prince, A.E.* 4001 (A). **Orangeburg Co.:** 1983/05/23, *Aulbach-Smith, C.A., Long, G. and Tallevast, T.* 2476 (USCH). **Pickens Co.:** 1975/07/18, *Boufford, D.E. and Wood, E.W.* 2077 (NCU). **Richland Co.:** 1976/08/26, *Nelson, J.B.* 681 (IBE). **Spartanburg Co.:** 1957/06/04, *Bell, R.C.* 8169 (NCU). **Sumpter Co.:** 1933/04/17, *Harbison, T.G. and Totten, H.R.* (NCU). **Union Co.:** 1993/05/09, *Horn, C.N.* 6627 (USCH). **Williamsburg Co.:** 1957/06/12, *Radford, A.E.* 24830 (NCU). **York Co.:** 1957/06/05, *Ahles, H.E. and Haesloop, J.G.* 27098 (NCU). **TENNESSEE. Anderson Co.:** 1961/06/30, *Ellis, W.H.* 28599 (TENN). **Cocke Co.:** 1898/07, *Ruth, A.* 286 (US). **Hamilton Co.:** 1921/04, *Beckwith, F.* 1024 (US). **Knox Co.:** 1938/06/29, *Sharp, A.J.* 232 (TENN). **Lawrence Co.:** 1898/07/18, *Ruth, A.* 294 (MO). **Union Co.:** 1934/07/10, *Kelly* 2473 (TENN). **TEXAS. Bell Co.:** 1902/05/08, *Reverchon, J.* (MO). **Jasper Co.:** 1963/04/14, *Correll, D.S. and Correll, H.B.* 27229 (MO). **Smith Co.:** 1949/05/15, *Shinners, J.H.* 11183 (GA). **VIRGINIA. Alleghany Co.:** 1909/05/19, *Eggleston, W.W.* 4374 (MO). **Amelia Co.:** 1937/05/25, *Lewis, J.B.* 555 (VPI). **Amherst Co.:** 1969/10/01, *Crandell, D.* 9669 (LYN). **Appomattox Co.:** 1967/07/07, *James, F.C.* 7231 (NCU). **Bedford Co.:** 1871/08, *Curtiss, A.H.* (GH). **Botetourt Co.:** 1967/05/06, *James, F.C.* (NCU). **Brunswick Co.:** 1968/04/21, *James, F.C.* 13252 (NCU). **Buckingham Co.:** 1951/06/29, *Jarrett, G.P. and Little, R.L.* 14622 (US). **Campbell Co.:** 1893/07/20, *Heller, A.* 1099 (MO). **Caroline Co.:** 1968/04/28, *James, F.C.* 13895 (NCU). **Chesterfield Co.:** 1971/06/10, *Johnson, M.F.* 23220 (NCU). **Craig Co.:** 1967/07/19, *James, F.C.* 7630 (NCU). **Dinwiddie Co.:** 1965/08/18, *James, F.C.* 2375 (NCU). **Fairfax Co.:** 1970/07/31, *Kiltz, B.F.* 57 (NLU). **Fluvanna Co.:** 1921/06/03, *Eggleston, W.W.* 17740 (US). **Franklin Co.:** 1966/07/15, *Ramsey, G.W. et al* 4938 (LYN). **Frederick Co.:** 1941/06/19, *Palmer, E.J.* 45271 (A). **Giles Co.:** 1935/09/07, *Adams, J.W. and Wherry E.* 2323 (A). **Goochland Co.:** 1970/05/28, *Johnson, M.F.* 3204 (VCU). **Greensville Co.:** 1944/06/22, *Fernald, M.L. and Lewis, J.B.* 14609 (US). **Hanover Co.:** 1968/04/26, *James, F.C.* 13446 (NCU). **Henry Co.:** 1968/05/28, *James, F.C.* 10443 (NCU). **Lee Co.:** 1968/05/17, *James, F.C.* 9791 (NCU). **Louisa Co.:** 1934/07/09, *Sharp, A.J.* 1102 (TENN). **Lunenburg Co.:** 1965/09/19, *James, F.C.* 3071 (NCU). **Mathews Co.:** 1852/05, *Bischoff, G.G.* (MO). **Mecklenburg Co.:** 1966/07/08, *Seaman, W.D.* 3739 (NCU). **Middlesex Co.:** 1966/07/14, *James, F.C.* (NCU). **Montgomery Co.:** 1962/07/02, *Kral, R.* 14818 (FSU). **New Kent Co.:** 1977/05/12, *Bims, S.* (VCU). **Patrick Co.:** 1950/07/24, *Mikula, B.* 6813 (WILLI). **Pittsylvania Co.:** 1893/07/30, *Heller, A.* 1099 (A). **Powhatan Co.:** 1967/06/08, *James, F.C.* 6279 (NCU). **Prince George Co.:** 1936/06/19, *Fernald, M.L. et al* 5791 (GH). **Roanoke Co.:** 1969/07/

29, Uttal, L.J. 6648 (VPI). **Rockbridge Co.:** 1881/05, J.R.C. (MO). **Rockingham Co.:** 1956/07/01, Allard, H.A. 21957 (US). **Shenandoah Co.:** 1970/05/19, Churchill, J.A. (MSC). **Smyth Co.:** 1892/06/20, Small, J.K. (US). Suffolk City, 1980/09/17, Wieboldt, T.F. 590 (WILLI). **Surry Co.:** 1934/08/17, Totten, H.R. (NCU). **Zuni Co.:** 1908/08/19, Render, A. (A). **WEST VIRGINIA. Grant Co.:** 1979/05/15, Duppsstadt, H. 029 (WVA). **Greenbrier Co.:** 1959/07/29, Clarkson, R.B. 2992 (NCU). **Hampshire Co.:** 1929/05/30, Walker, E.H. 303 (GA). **Hardy Co.:** 1955/06/16, Bartley, F. and Hicks, L.E. 2122 (NY). **Mineral Co.:** 1928/10/06, Eggleston, W.W. & Kelly, J.W. 22859 (US). **Morgan Co.:** 1969/05/10, Downs, R.M. 6349 (NCU). **Wyoming Co.:** 1900/08/13, Morris, E.L. 1189 (US).

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